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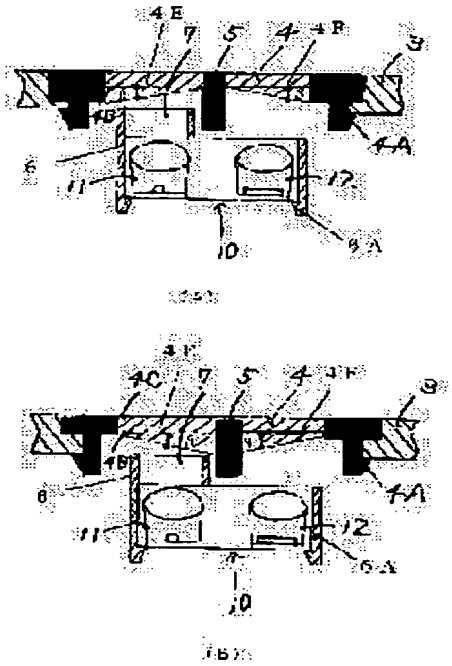
(54) SANITARY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a sanitary device capable of changing detection performance of a seating sensor of a sanitary cleaning device or a human detection sensor by exchanging only a filter without exchanging a sensor unit, by changing the thickness of a floodlight part or a light-receiving part of the filter, concerning the sensor unit disposed in the sanitary device.
SOLUTION: A range sensor is equipped with a light-emitting part provided in the sensor unit disposed in the sanitary device, for emitting light, the light- receiving part provided in the sensor unit, for detecting light reflected by an object and returned, and a decision circuit for deciding existence of detection of an object by a light-receiving spot position of the light received by the light- receiving part. The range sensor is also equipped with the filter provided in front of the light-emitting part and the light-receiving part, for covering the light-emitting part and the light-receiving part, and the thickness of the light- emitting part and the light-receiving part of the filter is changed.



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CLAIMS

[Claim(s)]
[Claim 1] The light-emitting part which has the light emitting device which turns the light for detection for body detection to a detected material object, and is emitted as incident light, The light sensing portion which has the photo detector which receives the reflected light by which said incident light reflects in a body and comes on the contrary, and performs the electrical output according to the light-receiving spot location, In the health equipment which has the body detection sensor system equipped with the decision circuit which judges the existence of an object by the print-out from said light sensing portion, and the filter prepared on the flux of light of said light-emitting part and/or said light sensing portion The 2nd page of the front flesh side of the couple which forms the translucent part which said incident light or reflected light of said filter penetrates the health equipment characterized by being constituted as the **** is leaned to another side when the core of the flux of light which penetrates said field of each table flesh side for **** is made into a straight line perpendicular to a passage and its field.
[Claim 2] Health equipment according to claim 1 with which the flat surface containing said both **** of the 2nd page of the front flesh side of said filter is characterized by the parallel thing to a flat surface including the shaft of the optical path of a light emitting device, and the shaft of the optical path of a photo detector.
[Claim 3] Health equipment according to claim 1 characterized by leaning the flat surface containing said both **** of the 2nd page of the front flesh side of said filter to a flat surface including the shaft of the optical path of a light emitting device, and the shaft of the optical path of a photo detector.
[Claim 4] Health equipment according to claim 1 to 3 characterized by having a monitor point modification means to change the monitor point which is the point that change optical relative-position relation with said filter with [two or more] the configurations of said light-emitting part, said light sensing portion, and said translucent part corresponding to said incident light or said reflected light of said filter, and the shaft of the optical paths of said incident light and said reflected light crosses.
[Claim 5] Health equipment according to claim 4 characterized by said monitor point modification means being that to which said light-emitting part or/and said light sensing portion are moved.
[Claim 6] Health equipment according to claim 4 characterized by being that as which said monitor point modification means moves said filter, and chooses the configuration of said translucent part.
[Claim 7] Health equipment according to claim 1 to 6 characterized by changing respectively a transparency section configuration [in / for the configurations of said light-emitting part, said light sensing portion, and said translucent part corresponding to said incident light or said reflected light of said filter / far point detection], and the transparency section configuration in near-point detection.
[Claim 8] Health equipment according to claim 1 to 7 characterized by having formed only said translucent part of said filter with the penetrable ingredient which penetrates said light for detection on level required for detection, and forming non-translucent parts other than said translucent part with the nontransparent nature ingredient which makes said light for detection

fully decrease or intercept.
[Claim 9] Health equipment according to claim 1 to 8 characterized by really fabricating said translucent part and non-translucent part in 2 color shaping, double shaping, or insert molding.
[Claim 10] Health equipment according to claim 1 to 9 characterized by making said translucent part and non-translucent part fix by adhesion.
[Claim 11] Health equipment according to claim 1 to 10 characterized by preparing the protection-from-light section which interrupts the optical transfer between the light-emitting part side by the side of the interior of a filter, and a light sensing portion side in said filter.
[Claim 12] Health equipment according to claim 1 to 11 characterized by having the sensor unit which made one said light-emitting part and said light sensing portion.
[Claim 13] Health equipment according to claim 1 to 12 characterized by making said filter and said sensor unit into one.
[Claim 14] Health equipment according to claim 1 to 13 characterized by making said sensor unit into one by fitting at said filter.
[Claim 15] Health equipment according to claim 1 to 13 characterized by making said sensor unit into one by engagement at said filter.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to health equipment equipped with the photosensor which detects a user's existence. It is suitable for the health equipment which has a body detection means to detect especially a taking-a-seat detection means to detect the existence of seat users, such as a local health washing station, an automatic toilet lid and a seat switchgear, and a closet automatic flushing device, and a closet user's existence. Moreover, it is suitable for automatic bibcock, a urinal automatic flushing device, automatic finger desiccation, sterilization, a sterilizer, etc.
[0002]
[Description of the Prior Art] As an example of the body detection sensor system of the conventional health equipment related to this invention, the taking-a-seat sensor of a health washing station explains. In drawing 29 which shows the taking-a-seat sensor of the conventional health washing station, a filter 4 is caught in the case covering 3, hooks section 4A, and is being fixed to the case covering 3. Moreover, as for the sensor unit 10, the light-emitting part 11, the light sensing portion 12, and the dashboard 13 are really formed. Here, the filter 4 made thickness of floodlighting section 4E homogeneity, and it considered and it was made so that incident light 21 might not be refracted with a filter 4. Moreover, similarly, the filter 4 made homogeneity thickness of light sensing portion 4F, and it considered and it was made so that the reflected light 22 might not be refracted with a filter 4. Therefore, the detection distance in the condition of a mounting beam health washing station was almost equivalent in the filter the detection distance in a sensor unit simple substance, and ahead of the sensor unit.
[0003]
[Problem(s) to be Solved by the Invention] However, in actual product development, the similar goods group which had the various variations according to a user based on one basic specification since it corresponded to the products offered of goods to various commercial-scene needs efficiently is developed in many cases. Therefore, also in the body detection sensor system called the taking-a-seat sensor of a health washing station, and a body detection sensor, it is required that the system of various variations should be developed as the response according to the requirement specification and the installation conditions of a user. Therefore, when lengthening detection distance of the taking-a-seat sensor of the conventional health washing station, or a body detection sensor or shortening in the conventional body detection sensor system, for example, it was common that the means of changing the location of the light-receiving lens 23 in the sensor unit 10 as shown in drawing 30 were taken. Moreover, modification of the light sensing portion which detects the dimension of a luminescence lens and the reflected light depending on the case, the decision circuit which judges the existence of detection of an object with the light-receiving spot location of the carrier beam light of a light sensing portion was needed, and great cost occurred, and the fabrication had taken time amount. Moreover, when the variation of the detection distance difference in a sensor unit increased, the assembly cost and management cost at the time of manufacture were high. The object of this invention be to offer the health equipment into which detectability ability as a body detection

sensor system carried in equipment call the taking a seat sensor and the body detection sensor of a health washing station be changeable , for example , without change the specification of the other sensor unit or a decision circuit , if only the filter which it have on the front optical path of a sensor unit be exchange , having been made in order that this invention may solve the above-mentioned technical problem .

[0004]

[Means for Solving the Problem and its Function and Effect] In order to solve the above-mentioned technical problem, with the health equipment of claim 1 The light-emitting part which has the light emitting device which turns the light for detection for body detection to a detected material object, and is emitted as incident light, The light sensing portion which has the photo detector which receives the reflected light by which said incident light reflects in a body and comes on the contrary, and performs the electrical output according to the light-receiving spot location, In the health equipment which has the body detection sensor system equipped with the decision circuit which judges the existence of an object by the print-out from said light sensing portion, and the filter prepared on the flux of light of said light-emitting part and/or said light sensing portion when the core of the flux of light which penetrates [the 2nd page of the front flesh side of the couple which forms the translucent part which said incident light or reflected light of said filter penetrates] said field of each table flesh side for **** is made into a straight line perpendicular to a passage and its field, it is characterized by being constituted as the **** is leaned to another side. While according to this invention it is reflected in a non-detecting body and the light projected from the light-emitting part of a body detection sensor system returns to a light sensing portion in the body detection sensor system of health equipment, when penetrating a filter, the "prism effectiveness" at which the track (optical path) of light turns will happen, and the shaft orientation of the optical path of the transmitted light will change. Thereby, the detection point as the point, i.e., a body detection sensor system, that the optical path of incident light and the reflected light crosses moves. Therefore, the detectability ability as a body detection sensor system carried in equipment can be changed into arbitration in three dimension, without changing the specification of the other sensor unit or a decision circuit by changing **** of the 2nd page of the front flesh side of a filter into a suitable combination.

[0005] In order to solve the above-mentioned technical problem, with both the health equipments of claim 2, the flat surface containing said **** of the 2nd page of the front flesh side of said filter is characterized by the parallel thing to a flat surface including the shaft of the optical path of a light emitting device, and the shaft of the optical path of a photo detector. While according to this invention it is reflected in a non-detecting body and the light projected from the light-emitting part of a body detection sensor system returns to a light sensing portion in the body detection sensor system of health equipment, when penetrating a filter, the "prism effectiveness", at which the track (optical path) of light turns will happen, and the shaft orientation of the optical path of the transmitted light will change. Thereby, the detection point as the point, i.e., a body detection sensor system, that the optical path of incident light and the reflected light crosses moves. Therefore, the detectability ability as a body detection sensor system carried in equipment can be changed into arbitration two-dimensional, without changing the specification of the other sensor unit or a decision circuit by changing **** of the 2nd page of the front flesh side of a filter into a suitable combination. The detection object distance from which the reflected light which carries out image formation returns to the light-receiving spot location judged to be those with detection by this changes, and detection distance of a sensor can be lengthened or can be shortened now.

[0006] In order to solve the above-mentioned technical problem, with both the health equipments of claim 3, the flat surface containing said **** of the 2nd page of the front flesh side of said filter is characterized by being leaned to a flat surface including the shaft of the optical path of a light emitting device, and the shaft of the optical path of a photo detector. While according to this invention it is reflected in a non-detecting body and the light projected from the light-emitting part of a body detection sensor system returns to a light sensing portion in the body detection sensor system of health equipment, when penetrating a filter, the "prism effectiveness" at which the track (optical path) of light turns will happen, and the shaft

orientation of the optical path of the transmitted light will change. Thereby, the detection point as the point, i.e., a body detection sensor system, that the optical path of incident light and the reflected light crosses moves. Therefore, the detectability ability as a body detection sensor system carried in equipment can be changed into arbitration, without changing the specification of the other sensor unit or a decision circuit by changing **** of the 2nd page of the front flesh side of a filter into a suitable combination.

[0007] in order to solve the above-mentioned technical problem , with the health equipment of claim 4 , it be characterize by to have a monitor point modification means change the monitor point which be the point that change optical relative position relation with said filter with [two or more] the configurations of said light-emitting part , said light sensing portion , and said translucent part corresponding to said incident light or said reflected light of said filter , and the shaft of the optical paths of said incident light and said reflected light cross . According to this invention, according to the installation condition of health equipment, it can choose in that site, or the optimal monitor point is beforehand set as the monitor point which doubled with the specification of the destination at the time of the assembly in works, and can be shipped to it. Moreover, a configuration including a filter, a light-emitting part, a light sensing portion, and a decision circuit is the same, and also when performing the products offered of goods with which other parts differ, it can respond by choosing optical relative-position relation in easy and cheap Kos.

[0008] In order to solve the above-mentioned technical problem, with the health equipment of claim 5, said monitor point modification means is characterized by being that to which said light-emitting part or/and said light sensing portion are moved. According to this invention, the health equipment suitable for the various monitor points can be obtained only by moving a light-emitting part or/and a light sensing portion to the location of the filter corresponding to a light-emitting part or/and the light sensing portions of each.

[0009] In order to solve the above-mentioned technical problem, with the health equipment of claim 6, it is characterized by being that as which said monitor point modification means moves said filter, and chooses the configuration of said translucent part. according to this invention, since incident light and the optical path of each reflected light are changeable with easy structure, a light-emitting part, a light sensing portion, and a decision circuit become possible [coming out as it is and changing the monitor point a lot]. therefore — for example, the detection mode in which the monitor points called taking a seat and standing up of a user differ when applying to a health washing station — a filter — electromagnetism — it can respond easily by making it move using actuators, such as a solenoid.

[0010] In order to solve the above-mentioned technical problem, with the health equipment of claim 7, it is characterized by changing respectively a transparency section configuration [in / for the configurations of said light-emitting part, said light sensing portion, and said translucent part corresponding to said incident light or said reflected light of said filter / far point detection], and the transparency section configuration in near-point detection. According to this invention, since the transparency section configuration in far point detection and the transparency section configuration in near-point detection can be changed respectively, it becomes possible to propose what suited the requirement specification and the installation conditions of a user in the far point detection engine performance and the near-point detection engine performance.

[0011] In each above-mentioned invention, it may divide into the part into which light penetrates a filter, and the part which light does not penetrate, the part which said light penetrates may be formed with a transparency ingredient, and the part which said light does not penetrate may be formed with a non-penetrated ingredient. Moreover, a filter may really be fabricated for the part which the light of a filter penetrates, and the part which light does not penetrate in 2 color shaping, double shaping, or insert molding. Furthermore, the part which the light of a filter penetrates, and the part which light does not penetrate may be fixed by adhesion. Furthermore, the protection-from-light section which interrupts the optical transfer between the light-emitting part side inside a filter and a light sensing portion side in a filter may be prepared.

[0012]

[Embodiment of the Invention] The taking-a-seat sensor of a local health washing station explains the gestalt of operation of this invention. Drawing 1 is the external view which equipped the Western style closet with the health washing station which is the example of the health equipment of this invention. Drawing 2 is the state diagram which attached the taking-a-seat sensor in the case plate.

[0013] Drawing 3 (A) is the filter which is the 1st example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount. Drawing 3 (B) is the filter which is the 2nd example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount. Drawing 4 (A) is the filter which is the 3rd example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount. Drawing 4 (B) is the filter which is the 4th example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount. Drawing 5 (A) is the filter which is the 5th example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount. Drawing 5 (B) is the filter which is the 6th example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount. Drawing 6 is drawing showing the geometric relation of the incident light of a taking-a-seat sensor, and the reflected light. Drawing 7 is drawing in the condition of having had the filter with the uniform thickness of the floodlighting section and a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light. Drawing 8 is the enlarged drawing in drawing 7 showing the geometric relation in which the reflected light passes a light sensing portion. Drawing 9 is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having had the filter with the uniform thickness of the floodlighting section and a light sensing portion ahead [taking-a-seat sensor]. Drawing 1010 is an enlarged drawing in drawing 9 showing the geometric relation of the amount of detection distance fluctuation.

[0014] beta** Drawing 11 is drawing in the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thick towards a light-receiving-the floodlighting section which is 1st example of this invention side. Drawing 12 is the enlarged drawing in drawing 11 showing the geometric relation in which the reflected light passes a light sensing portion. beta** Drawing 13 is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] about one side so that it may become thick towards a light-receiving-the floodlighting section which is 1st example of this invention side.

[0015] beta** Drawing 14 is drawing in the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thin towards a light-receiving-the floodlighting section which is 2nd example of this invention side. Drawing 15 is the enlarged drawing in drawing 14 showing the geometric relation in which the reflected light passes a light sensing portion. beta** Drawing 16 is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] about one side so that it may become thin towards a light-receiving-the floodlighting section which is 2nd example of this invention side.

[0016] beta** Drawing 17 is drawing in the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thin towards a floodlighting-light sensing portion which is 3rd example of this invention side. Drawing 18 is the enlarged drawing in drawing 17 showing the geometric relation in which the reflected light passes the floodlighting section. Drawing 19 beta** It is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] about one side so that it may become thin

towards a floodlighting-light sensing portion which is 3rd example of this invention side.
[0017] beta** Drawing 20 is drawing in the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thick towards a floodlighting-light sensing portion which is 4th example of this invention side. Drawing 21 is the enlarged drawing in drawing 20 showing the geometric relation in which the reflected light passes the floodlighting section. beta** Drawing 22 is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] about one side so that it may become thick towards a floodlighting-light sensing portion which is 4th example of this invention side.
[0018] Drawing 23 is drawing showing the case where the filter and sensor mount which are the 5th example of this invention are formed in one.
[0019] Drawing 24 is drawing showing the case where two or more filters with which the inclinations of a field differ respectively in the floodlighting section and the light sensing portion which are the 6th example of this invention are arranged.
[0020] Drawing 25 is drawing showing the geometric relation of the amount of detection distance fluctuation at the time of moving the filter which is the 7th example of this invention, and choosing the configuration of said translucent part.
[0021] Drawing 26 is drawing showing the case where changed the thickness of the floodlighting section which is the 8th example of this invention, and a light sensing portion, and the monitor point is changed in the direction of an elevation angle. Drawing 27 is drawing showing the geometric relation to the far point detection engine performance and the near-point detection engine performance.
[0022] Drawing 28 is drawing showing the geometric relation of the amount of detection distance fluctuation at the time of moving the filter which is the 9th example of this invention, and choosing the configuration of said translucent part.
[0023] Drawing 29 is the sectional view showing the conventional filter and the condition of a taking-a-seat sensor. Drawing 30 is drawing in the condition of having had the filter with uniform conventional floodlighting section and thickness of a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light.
[0024] Hereafter, the 1st example of this invention is explained, referring to drawing 1 , 2 and 3 (A), and 6-13. As shown in drawing 1 and 2, 1 is a body of a health washing station. The case covering 3 is attached on the case plate 2, the body of a sensor is arranged into the case plate 2 and the case covering 3, and the filter 4 of the taking-a-seat sensor 10 is attached in the case covering 3.
[0025] As shown in drawing 3 (A), the filter 4 has the protection-from-light member 5 which breaks off its relationship between 4F a light-emitting part side 4E and light sensing portion side, is caught in the case covering 3, hooks section 4A, and is being fixed to the case covering 3. It is caught, where the light-emitting part 11 and the light sensing portion 12 were really formed and the taking-a-seat sensor 10 is inserted in the sensor mount 6, and it engages with section 6A, and the sensor mount 6 is attached in the boss 9 of a case plate with the sensor mount fastener (screw) 8 in the case covering 3. The sensor mount 6 has the tubed protection-from-light section 7 in a light-emitting part 11 side, and overlaps the tubed protection-from-light section 7 and the protection-from-light member 5.
[0026] Then, by changing the thickness of the floodlighting section of the filter which it has ahead [sensor] explains the principle which changes the detectability ability of a taking-a-seat sensor or a body detection sensor. As shown in drawing 6 , the front face 24 of Y2 and the taking-a-seat sensor 10 to distance between the detection objects 40 is set [the distance between light sensing portions 12] to L0 for the front face 24 of Y1 and the taking-a-seat sensor 10 to the distance between the light-receiving lenses 23 from the light-receiving lens 23 of the taking-a-seat sensor 10. Moreover, distance between the detection point locations 15 of a photo detector is set to X1 from the core of a light-emitting part 11. In that case, the incident light 21 from a light-emitting part 11 is thinly irradiated with the floodlighting lens 20 to the rat

tail detection object 40. Diffuse reflection of the incident light 21 is carried out on the front face of the detection object 40, and image formation of the reflected light 22 of angle of reflection theta 0 is carried out on the detection point location 15 of a light sensing portion with the light-receiving lens 23. The light-receiving angle theta 0 is searched for by ** formula.
theta0=Atan (X1/(L0+Y1+Y2)) ..... (1) [0027] Next, as shown in drawing 7 and 8, the case where it has the filter 4 with the uniform thickness of light sensing portion 4F to the front uniformly [the thickness of floodlighting section 4E] at parallel at the taking-a-seat sensor 10 is explained. Distance between the front faces of a filter is set to Y3 from the front face of the taking-a-seat sensor 10. In that case, the incident light 21 from a light-emitting part 11 advances to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree to floodlighting section 4E of a filter 4, and passes from floodlighting section 4E to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree outside. The incident light 21 is irradiated to the detection object 40, and carries out diffuse reflection on the front face of the detection object 40. Reflected light 22A of the angle of reflection theta 0 which carried out diffuse reflection advances to the normal 51 of datum-level A (50) at angle-of-projection theta0 degree and angle-of-refraction theta1 degree to light sensing portion 4F of a filter 4 (reflected light 22B), and passes from light sensing portion 4F to the normal 51 of datum-level A (50) at angle-of-projection theta1 degree and angle-of-refraction theta0 degree outside (reflected light 22). here — the refractive index of air — the refractive index of N and a filter — N — ' — ** — if it carries out, the angle of refraction theta 1 will be called for by ** formula. Since it becomes N'/N=sintheta0-/sintheta1 with the second principle of refraction, it is theta1=Asin (N/N'*sintheta0)..... (2), therefore amount **Lof detection distance fluctuation 1 under the effect of a filter are calculated by (3) formulas. Since it is a=t0*tantheta0, b=t0*tantheta1, and c=a-b here as shown in drawing 9 and 10, it is **L1=c/tantheta0**L1=t0*(tantheta0-tantheta1)/tantheta0..... (3) [0028] beta** Next, as shown in drawing 11 and 12, lean one side so that only the floodlighting section of a filter 4 may become thick towards a light-receiving side. The field beta** Leaned is set to datum-level B (52). In that case, the incident light 21 from a light-emitting part 11 advances to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree to floodlighting section 4E of a filter 4, and passes from floodlighting section 4E at angle-of-projection beta** and angle-of-refraction theta4 degree to the normal 53 of datum-level B (52) outside. The incident light 21A is irradiated to the detection object 40, and carries out diffuse reflection on the front face of the detection object 40. The reflected light 22A advances to the normal 51 of datum-level A (50) at angle-of-projection theta0 degree and angle-of-refraction theta1 degree to light sensing portion 4F of a filter 4, and passes from light sensing portion 4F to the normal 51 of datum-level A (50) at angle-of-projection theta1 degree and angle-of-refraction theta0 degree outside (reflected light 22).
[0029] The angle of refraction theta 4 is called for by (7) formulas. The second principle of refraction Since it becomes N'/N=sintheta4-/sin beta , theta4=Asin (N' / N*sin beta) ..... (7) Therefore, relation with an angle of refraction [at the time of having a filter with uniform angle of refraction theta 4, tilt angle beta of the floodlighting section, and thickness of the floodlighting section] of 0 degree 4< 0 degree of beta-theta Since it becomes, as compared with the case where the distance between the detection objects 40 has a filter with the uniform thickness of a light sensing portion uniformly [the thickness of the floodlighting section] from the front face of the taking-a-seat sensor 10, it will become short. The distance **L4 are calculated by (13) formulas. here, it is shown in drawing 13 — as — k=(L0+**L1-Y3-**L4) *tan (theta4-beta) it is — a sake — **L4=k/tan theta 0 (L4=(L0+**L1-Y3) *tan(theta4-beta)/(tantheta0+tan (theta4-beta)) ..... 13 [0030]) According to this invention, when incident light 21 penetrates floodlighting section 4E of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that floodlighting section 4E of a filter 4 may be turned to a light-receiving side and it may become thick, and the include angle of incident light 21 will change. This will become short as compared with the case where the distance between the detection objects 40 has a filter with the uniform thickness of a light sensing portion uniformly [the thickness of the floodlighting

section] from the front face of the taking-a-seat sensor 10. Therefore, the detectability ability of the taking-a-seat sensor of a health washing station or a body detection sensor can be changed short, without changing the detectability ability of a sensor unit, if only the filter which it has ahead of the sensor unit is exchanged.

[0031] next, the 2nd example of this invention — drawing 3 (B), and 14 and 15 — it explains, referring to 16 times. beta** As shown in drawing 3 (B), and 14 and 15, lean one side so that only the floodlighting section of a filter 4 may become thin towards a light-receiving side. Let the field beta** Leaned be datum level C (54). In that case, the incident light 21 from a light-emitting part 11 advances to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree to floodlighting section 4E of a filter 4, and passes from floodlighting section 4E at angle-of-projection beta** and angle-of-refraction theta5 degree to the normal 55 of datum level C (54) outside. The incident light 21B is irradiated to the detection object 40, and carries out diffuse reflection on the front face of the detection object 40. The reflected light 22A advances to the normal 51 of datum-level A (50) at angle-of-projection theta0 degree and angle-of-refraction theta1 degree to light sensing portion 4F of a filter 4, and passes from light sensing portion 4F to the normal 51 of datum-level A (50) at angle-of-projection theta1 degree and angle-of-refraction theta0 degree outside (reflected light 22).

[0032] The angle of refraction theta 5 is called for by (8) formulas. The second principle of refraction N'/N=sintheta5-/sin beta Since it becomes, Relation with an angle of refraction [at the time of having a filter with uniform theta5=Asin (N'/N*sin beta**) (8) therefore angle of refraction theta 5, tilt angle beta of the floodlighting section, and thickness of the floodlighting section] of 0 degree theta5-beta> 0 degree Since it becomes, as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of the floodlighting section from the front face of the taking-a-seat sensor 10, it will become long. The distance **L5 are calculated by (14) formulas. here, it is shown in drawing 16 -- as — m=(L0+**L1-Y3+**L5) *tan (theta5-beta) it is — a sake — **L5=m/tan theta 0 (L5= (L0+**L1-Y3) *tan (theta5-beta)/(tantheta0-tan (theta5-beta)) ..... 14 [0033]) According to this invention, when incident light 21 penetrates floodlighting section 4E of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that floodlighting section 4E of a filter 4 may be turned to a light-receiving side and it may become thin, and the include angle of incident light 21 will change. This will become long as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of the floodlighting section from the front face of the taking-a-seat sensor 10. Therefore, the detectability ability of the taking-a-seat sensor of a health washing station or a body detection sensor can be changed for a long time, without changing the detectability ability of a sensor unit, if only the filter which it has ahead of the sensor unit is exchanged.

[0034] Next, the 3rd example of this invention is explained, referring to drawing 4 (A), and 17, 18 and 19. beta** As shown in drawing 4 (A), and 17 and 18, lean one side so that only the light sensing portion of a filter 4 may become thin towards a floodlighting side. Let the field beta** Leaned be datum level D (56). In that case, the incident light 21 from a light-emitting part 11 advances to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree to floodlighting section 4E of a filter 4, and passes from floodlighting section 4E to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree outside. The incident light 21 is irradiated to the detection object 40, and carries out diffuse reflection on the front face of the detection object 40. The reflected light 22C advances to the normal 57 of datum level D (56) at angle-of-projection theta7 degree and angle-of-refraction theta6 degree to light sensing portion 4F of a filter 4 (reflected light 22D), and passes from light sensing portion 4F to the normal 51 of datum-level A (50) at angle-of-projection theta1 degree and angle-of-refraction theta0 degree outside (reflected light 22).

[0035] The angle of refraction theta 6 is called for by (9) formulas.

theta6=theta1-beta ..... (9) — angle of projection theta 7 is searched for by (10) formulas again. second principle of refraction N'/N=sintheta7/sintheta6 since it becomes — theta7=Asin (N'/N*sin theta 6) — here, theta7=Asin (N'/N*sin (theta1-beta)), if (9) is substituted ..... (10)

Therefore, the relation of angle of projection theta 7 and the angle of projection theta 0 at the time of having a filter with uniform tilt angle beta of a light sensing portion and thickness of a light sensing portion theta7+ beta<theta 0 Since it becomes, as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of a light sensing portion from the front face of the taking-a-seat sensor 10, it will become long.

[0036] The distance **L6 is calculated by (15) formulas. here, it is shown in drawing — as — X3=(L0+**L1-Y3) *tantheta0X3=(L0+**L1-Y3+**L6) *tantheta8 A sake it is — **L6=(L0+**L1-Y3) *(tantheta0-tantheta8)/tantheta8 — here — theta8=theta7+beta (it is — sake L6= (L0+**L1-Y3) * (tantheta0-tan (theta7+beta))/tan (theta7+beta) .... 15 [0037]) According to this invention, when reflected light 22C penetrates light sensing portion 4F of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that it may become thin towards a light sensing portion 4F of filter 4 floodlighting-side, and the include angle of the reflected light will change. This will become long as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of a light sensing portion from the front face of the taking-a-seat sensor 10. Therefore, the detectability ability of the taking-a-seat sensor of a health washing station or a body detection sensor can be changed for a long time, without changing the detectability ability of a sensor unit, if only the filter which it has ahead of the sensor unit is exchanged.

[0038] Next, the 4th example of this invention is explained, referring to drawing 4 (B), and 20, 21 and 22. beta** As shown in drawing 4 R> 4 (B), and 20 and 21, lean one side so that only the light sensing portion of a filter 4 may become thick towards a floodlighting side. The field beta** Leaned is set to datum-level E (58). In that case, the incident light 21 from a light-emitting part 11 advances to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree to floodlighting section 4E of a filter 4, and passes from floodlighting section 4E to the normal 51 of datum-level A (50) with the angle of projection of 0 degree, and the angle of refraction of 0 degree outside. The incident light 21 is irradiated to the detection object 40, and carries out diffuse reflection on the front face of the detection object 40. The reflected light 22E advances to the normal 59 of datum-level E (58) at angle-of-projection theta10 degree and angle-of-refraction theta9 degree to light sensing portion 4F of a filter 4 (reflected light 22F), and passes from light sensing portion 4F to the normal 51 of datum-level A (50) at angle-of-projection theta1 degree and angle-of-refraction theta0 degree outside (reflected light 22).

[0039] The angle of refraction theta 9 is called for by (11) formulas.
theta9=theta1+beta .... (11) — angle of projection theta 10 is searched for by (12) formulas again. the second principle of refraction since it becomes N'/N=sintheta10-/sintheta9 — theta10=Asin (N'/N*sin theta 9) — here If (11) is substituted, it is theta10=Asin (N'/N*sin (theta1+beta))....
(12), therefore angle of projection theta 10, Relation of the angle of projection theta 0 at the time of having a filter with uniform tilt angle beta of a light sensing portion and thickness of a light sensing portion theta10-beta>theta 0 Since it becomes, as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of a light sensing portion from the front face of the taking-a-seat sensor 10, it will become short.

[0040] The distance **L7 are calculated by (16) formulas. here, it is shown in drawing — as — X3=(L0+**L1-Y3) *tantheta0X3=(L0+**L1-Y3-**L7) *tantheta11 A sake it is — **L7= (L0+**L1-Y3) *(tantheta11-tantheta0)/tantheta11 — here — theta11=theta10-beta it is — sake L7=(L0+**L1-Y3) * (tan(theta10-beta)-tantheta0)/tan (theta10-beta) (.... 16 [0041]) According to this invention, when reflected light 22C penetrates light sensing portion 4F of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that it may become thick towards a light sensing portion 4F of filter 4 floodlighting-side, and the include angle of the reflected light will change. This will become short as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of a light sensing portion from the front face of the taking-a-seat sensor 10. Therefore, the detectability ability of the taking-a-seat sensor of a health washing station or a body detection sensor can be

changed short, without changing the detectability ability of a sensor unit, if only the filter which it has ahead of the sensor unit is exchanged.

[0042] Next, the 5th example of this invention is explained, referring to drawing 5 (A). beta** As shown in drawing 5 (A), turn floodlighting section 4E of a filter 4 to a light-receiving side, beta** Lean one side so that it may become thin, and lean one side so that it may become thin towards a light sensing portion 4F of filter 4 floodlighting-side. According to this invention, when incident light penetrates floodlighting section 4E of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that floodlighting section 4E of a filter 4 may be turned to a light-receiving side and it may become thin, and the include angle of incident light will change. This will become long as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of the floodlighting section from the front face of the taking-a-seat sensor 10.

[0043] Moreover, when the reflected light penetrates light sensing portion 4F of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that it may become thin towards a light sensing portion 4F of filter 4 floodlighting-side, and the include angle of the reflected light will change. This will become long as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of a light sensing portion from the front face of the taking-a-seat sensor 10. Therefore, the detectability ability of the taking-a-seat sensor of a health washing station or a body detection sensor can be changed still longer, without changing the detectability ability of a sensor unit, if only the filter which it has ahead of the sensor unit is exchanged.

[0044] Next, the 6th example of this invention is explained, referring to drawing 5 (B). beta** As shown in drawing 5 (B), turn floodlighting section 4E of a filter 4 to a light-receiving side, beta** Lean one side so that it may become thick, and lean one side so that it may become thick towards a only light sensing portion 4F of filter 4 floodlighting-side. According to this invention, when incident light penetrates floodlighting section 4E of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that floodlighting section 4E of a filter 4 may be turned to a light-receiving side and it may become thick, and the include angle of incident light will change. This will become short as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of the floodlighting section from the front face of the taking-a-seat sensor 10.

[0045] Moreover, when reflected light 22C penetrates light sensing portion 4F of a filter 4 by beta** Leaning one side, the "prism effectiveness" will happen, so that it may become thick towards a light sensing portion 4F of filter 4 floodlighting-side, and the include angle of the reflected light will change. This will become short as compared with the case where the distance between the detection objects 40 is equipped with a filter with the uniform thickness of a light sensing portion from the front face of the taking-a-seat sensor 10. Therefore, the detectability ability of the taking-a-seat sensor of a health washing station or a body detection sensor can be changed still shorter, without changing the detectability ability of a sensor unit, if only the filter which it has ahead of the sensor unit is exchanged.

[0046] Moreover, the part which divides into the part into which light penetrates a filter, and the part which light does not penetrate, and forms the part which said light penetrates with a transparency ingredient, and said light does not penetrate can be cheaply manufactured by forming with a non-penetrated ingredient as compared with the case where all are formed with a transparency ingredient. Dirt, dust, etc. become furthermore, less boring to lose a crevice among both in the part which the light of a filter penetrates, and the part which light does not penetrate by really fabricating a filter in 2 color shaping, double shaping, or insert molding. Moreover, an appearance can be made good by making it this construction material and the same color. furthermore, it is good, and adhesion is also boiled markedly and bonding strength's improves.

[0047] Furthermore, since the protection-from-light member 5 overlaps the tubed protection-from-light section 7 even if the light from a light-emitting part 11 reflects irregularly when waterdrop arises in filter inner surface 4B by forming the protection-from-light section 5 which interrupts the optical transfer between the light-emitting part 11 side inside a filter, and a light sensing portion 12 side, the reflected light reflected irregularly by inner surface 4B of a filter 4

leaks to a light sensing portion 12, and does not shine upon a filter 4. Moreover, although the light from a light-emitting part 11 reflects irregularly on a filter outside surface and the reflected light inside a filter occurs even when filter outside surface 4C is stained with dirt, such as waterdrop, a crack, and urine, the reflected light remains in the light-emitting part 11 side of a filter 4 by the protection-from-light member 5 which breaks off its relationship between the light-emitting part 11 side of a filter 4, and light sensing portion 12 sides. Therefore, the effect of the light to which the reflected light inside a filter stops going into a light sensing portion 12, and carries out internal reflection of the inside of a filter with the thickness of the filter itself can be lost thoroughly. therefore, the incorrect detection by dirt, such as waterdrop of a filter inner surface and waterdrop of a filter outside surface, a crack, and urine, is prevented, and the dependability of a sensor is markedly alike and improves.

[0048] Furthermore, as shown in drawing 23 , a filter 4 and the sensor mount 6 may be formed in one, and the taking-a-seat sensor 10 may be fixed to the sensor mount 6. By doing so, the location variation between a filter 4 and the sensor mount 6 is lost, the variation in the sensing field of a taking-a-seat sensor becomes small, and the precision of sensing of a sensor improves.

[0049] Furthermore, as shown in drawing 24 , a filter 4 prepares 4F a light-emitting part side 4E and light sensing portion side up, and prepares 4H a 4G and light sensing portion side a light-emitting part side caudad. It has the protection-from-light member 5 which breaks off its relationship the meantime, and is fixed to the case covering 3. The taking-a-seat sensor 10 can carry out movable caudad with the upper part of a filter 4. By changing thickness change of 4H with thickness change of 4F a 4G and light sensing portion side the light-emitting part side of the lower part of a filter 4 an upper light-emitting part side 4E [of a filter 4], and light sensing portion side, the "prism effectiveness" of the upper part and a lower part will differ, and the include angle of incident light and the reflected light will change. By this, the distance between the detection objects 40 will differ in the upper part and a lower part from the front face of the taking-a-seat sensor 10.

[0050] Therefore, it becomes discriminable [those who are standing in front of discernment of those who could get different detectability ability, for example, are sitting down on the seat, and a closet] by carrying out movable [of the taking-a-seat sensor 10] to the upper part of a filter 4 caudad. Therefore, conventionally, although two sensors were used, if this technique is used, one sensor can attain and it will become a large cost cut.

[0051] Furthermore, as shown in drawing 25 , by moving a filter 4 and changing the thickness of 4F a light sensing portion side, the "prism effectiveness" migration before and after migration will differ, and the include angle of the reflected light will change. By this, from the front face of the taking-a-seat sensor 10, the distance between the detection objects 40 is a migration front and after migration, and will differ.

[0052] Therefore, it becomes discriminable [those who are standing in front of discernment of those who could get different detectability ability, for example, are sitting down on the seat by migration of a filter 4, and a closet]. Therefore, conventionally, although two sensors were used, if this technique is used, one sensor can attain and it will become a large cost cut.

[0053] Furthermore, incident light 21 changes floodlighting section 4E by changing thickness in the direction of an elevation angle, and the monitor point is made to change in the direction of an elevation angle, as shown in drawing 26 . Therefore, the monitor point can be set up regardless of a sensor layout. Furthermore, if the different monitor point can be obtained, for example, migration of a filter 4 or migration of a sensor 10 is always performed by migration of a filter 4 or migration of a sensor 10, a monitor will become possible at the three-dimension target which is standing in front of the closet.

[0054] As shown in drawing 27 , at the time of far point detection, the reflected light 22 passes far point light sensing portion transparency point 62a of a filter 4. Moreover, at the time of near-point detection, 22g of reflected lights passes near-point light sensing portion transparency point 62b of a filter 4. In that case, detectable field 60a and detection impossible field 61a become as [show / in drawing 27]. Then, in order to change so that reflected light 22c may pass far point light sensing portion transparency point 62a of a filter 4 by changing respectively the

configuration of said translucent part corresponding to far point light sensing portion transparency point 62a at the time of far point detection, and near-point light sensing portion transparency point 62b at the time of near-point detection as shown in drawing 28 , a detection object changes from 40a to 40c.

[0055] Moreover, in order to change so that 22h of reflected lights may pass near-point light sensing portion transparency point 62b of a filter 4 at the time of near-point detection, a detection object changes from 40b to 40d. Therefore, a detectable field changes from 60a to 60b, and 61a changes [a detection impossible field] to 61b. Therefore, according to this invention, it becomes possible to propose the thing appropriate for the requirement specification and the installation conditions of a user.

[0056] Although the example of this invention was explained in full detail above, this is an example to the last, and various deformation is possible for it unless the summary of this invention is changed. Moreover, although the health washing station was mentioned as the example and explained as an example, this invention can be applied to other natural health equipments, and it can apply to the equipment which makes a toilet lid or the seat open and close automatically, the equipment to which closet washing is carried out automatically, automatic bibcock, urinal automatic washing, automatic finger desiccation, sterilization, a sterilizer, etc.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The perspective view of the body of a health washing station of this invention is shown.
[Drawing 2] Drawing of the case plate of this invention, a taking-a-seat sensor, and the mounting condition of a sensor mount is shown.
[Drawing 3] (A) They are the filter which is the 1st example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount.
(B) They are the filter which is the 2nd example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount.
[Drawing 4] (A) They are the filter which is the 3rd example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount.
(B) They are the filter which is the 4th example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount.
[Drawing 5] (A) They are the filter which is the 5th example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount.
(B) They are the filter which is the 5th example of this invention, a taking-a-seat sensor, and the sectional view showing the condition of a sensor mount.
[Drawing 6] It is drawing showing the geometric relation of the incident light of a taking-a-seat sensor, and the reflected light.
[Drawing 7] It is drawing in the condition of having had the filter with the uniform thickness of the floodlighting section and a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light.
[Drawing 8] It is the enlarged drawing in drawing 7 showing the geometric relation in which the reflected light passes a light sensing portion.
[Drawing 9] It is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having had the filter with the uniform thickness of the floodlighting section and a light sensing portion ahead [taking-a-seat sensor].
[Drawing 10] It is the enlarged drawing in drawing 9 showing the geometric relation of the amount of detection distance fluctuation.
[Drawing 11] beta** It is drawing in the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thick towards a light-receiving-the floodlighting section which is 1st example of this invention side.
[Drawing 12] It is the enlarged drawing in drawing 11 showing the geometric relation in which the reflected light passes a light sensing portion.
[Drawing 13] beta** It is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] about one side so that it may become thick towards a light-receiving-the floodlighting section which is 1st example of this invention side.

[Drawing 14] beta** It is drawing in the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thin towards a light-receiving-the floodlighting section which is 2nd example of this invention side.
[Drawing 15] It is the enlarged drawing in drawing 14 showing the geometric relation in which the reflected light passes a light sensing portion.
[Drawing 16] beta** It is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of a light sensing portion ahead [taking-a-seat sensor] about one side so that it may become thin towards a light-receiving-the floodlighting section which is 2nd example of this invention side.
[Drawing 17] beta** It is drawing in the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thin towards a floodlighting-light sensing portion which is 3rd example of this invention side.
[Drawing 18] It is the enlarged drawing in drawing 17 showing the geometric relation in which the reflected light passes the floodlighting section.
[Drawing 19] beta** It is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] about one side so that it may become thin towards a floodlighting-light sensing portion which is 3rd example of this invention side.
[Drawing 20] beta** It is drawing in the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] showing the geometric relation of incident light and the reflected light about one side so that it may become thick towards a floodlighting-light sensing portion which is 4th example of this invention side.
[Drawing 21] It is the enlarged drawing in drawing 20 showing the geometric relation in which the reflected light passes the floodlighting section.
[Drawing 22] beta** It is drawing showing the geometric relation of the amount of detection distance fluctuation under the effect of a filter to the condition of having leaned and having had the filter with the uniform thickness of the floodlighting section ahead [taking-a-seat sensor] about one side so that it may become thick towards a floodlighting-light sensing portion which is 4th example of this invention side.
[Drawing 23] It is drawing showing the case where the filter and sensor mount which are the 5th example of this invention are formed in one.
[Drawing 24] It is drawing showing the case where two or more filters with which the inclinations of a field differ respectively in the floodlighting section and the light sensing portion which are the 6th example of this invention are arranged.
[Drawing 25] It is drawing showing the geometric relation of the amount of detection distance fluctuation at the time of moving the filter which is the 7th example of this invention, and choosing the configuration of said translucent part.
[Drawing 26] It is drawing showing the case where changed the thickness of the floodlighting section which is the 8th example of this invention, and a light sensing portion, and the monitor point is changed in the direction of an elevation angle.
[Drawing 27] It is drawing showing the geometric relation to the far point detection engine performance and the near-point detection engine performance.
[Drawing 28] It is drawing showing the geometric relation of the amount of detection distance fluctuation at the time of moving the filter which is the 9th example of this invention, and choosing the configuration of said translucent part.
[Drawing 29] It is the sectional view showing the conventional filter and the condition of a taking-a-seat sensor unit.
[Drawing 30] It is drawing in the condition of having had the filter with uniform conventional floodlighting section and thickness of a light sensing portion ahead [taking-a-seat sensor]

showing the geometric relation of incident light and the reflected light.

[Description of Notations]

1 Body of Health Washing Station
2 Case Plate
3 Case Covering
4 Filter
4A Connection section
4E Floodlighting section side
4F Light sensing portion side
5 Protection-from-Light Member
6 Sensor Mount
7 Tubed Protection-from-Light Section
8 Mount Fastener (Screw)
9 Boss
10 Taking-a-Seat Sensor
11 Light-emitting Part
12 Light Sensing Portion
13 Dashboard
14 Elastic Member
15 Detection Point Location
16 Monitor Point
20 Luminescence Lens
21 Incident Light
22 Reflected Light
23 Light-receiving Lens
24 Front Face (Taking-a-Seat Sensor)
40 Detection Object
50 Datum Level A
51 Normal to Datum Level A
52 Datum Level B
53 Normal to Datum Level B
54 Datum Level C
55 Normal to Datum Level C
56 Datum Level D
57 Normal to Datum Level D
58 Datum Level E
59 Normal to Datum Level E
60a, 60b Detectable field
61a, 61b Detection impossible field

[Translation done.]

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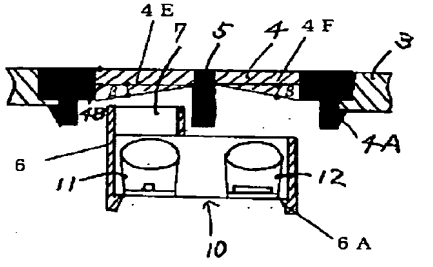
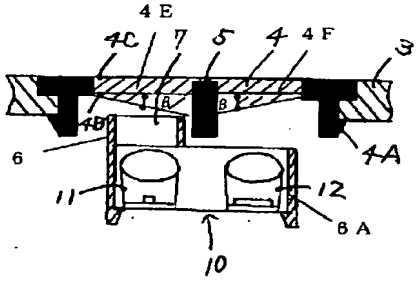
最終頁に続く

(54)【発明の名称】　衛生装置

(57)【要約】
【課題】　衛生装置内に配設されるセンサユニットに関するもので、フィルターの投光部や受光部の厚みを変化させることにより、フィルターのみ交換すれば、センサユニットを交換すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能を変えることができる衛生装置を提供することにある。
【解決手段】　衛生装置内に配設されるセンサユニットに設けられ光を発する発光部と、前記センサユニットに設けられ前記光が物体に反射して返ってくる光を検知する受光部と、前記受光部の受けた光の受光スポット位置により対象物の検出の有無を判断する判断回路を備えた測距センサにおいて、前記発光部及び前記受光部の前方に設けられ前記発光部及び受光部を覆うフィルターを備え、前記フィルターの発光部と受光部の厚みを変化させる。



(A)



(B)

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【特許請求の範囲】

【請求項１】　物体検知用の検知用光を被検出物体に向けて投射光として発する発光素子を有する発光部と、前記投射光が物体に反射して返ってくる反射光を受けその受光スポット位置に応じた電気的出力を行なう受光素子を有する受光部と、前記受光部からの出力情報により対象物の有無を判断する判断回路と、前記発光部および／または前記受光部の光束上に設けられたフィルターとを、備えた物体検出センサシステムを有する衛生装置において、前記フィルターの前記投射光または反射光が透過する透光部を形成する一対の表裏２面を、面軸を前記表裏各々の面を透過する光束の中心を通りかつその面に鉛直な直線とした時に、その面軸が他方に対して傾けられているように構成されていることを特徴とする衛生装置。

【請求項２】　前記フィルターの表裏２面の前記面軸をともに含む平面が、発光素子の光路の軸と受光素子の光路の軸とを含む平面に対して、平行であることを特徴とする請求項１記載の衛生装置。

【請求項３】　前記フィルターの表裏２面の前記面軸をともに含む平面が、発光素子の光路の軸と受光素子の光路の軸とを含む平面に対して、傾けられていることを特徴とする請求項１記載の衛生装置。

【請求項４】　前記発光部と、前記受光部と、前記フィルターの前記投射光または前記反射光に対応する前記透光部の形状を複数有した前記フィルターとの光学的な相対位置関係を変更して前記投射光と前記反射光の各々の光路の軸が交差する点である監視ポイントを変化させる監視ポイント変更手段を有することを特徴とする請求項１乃至３記載の衛生装置。

【請求項５】　前記監視ポイント変更手段が、前記発光部または／および前記受光部を移動させるものであることを特徴とする請求項４記載の衛生装置。

【請求項６】　前記監視ポイント変更手段が、前記フィルターを移動させて前記透光部の形状を選択するものであることを特徴とする請求項４記載の衛生装置。

【請求項７】　前記発光部と、前記受光部と、前記フィルターの前記投射光または前記反射光に対応する前記透光部の形状を遠点検知における透過部形状と近点検知における透過部形状を各々変化させたことを特徴とする請求項１乃至６記載の衛生装置。

【請求項８】　前記フィルターの前記透光部のみを前記検知用光を検知に必要なレベルで透過する透過性材料で形成し、前記透光部以外の非透光部を前記検知用光を充分に減衰又は遮断させる非透過性材料で形成したことを特徴とする請求項１乃至７記載の衛生装置。

【請求項９】　前記透光部と非透光部を２色成形、または、２重成形、または、インサート成形にて一体成形したことを特徴とする請求項１乃至８記載の衛生装置。

【請求項１０】　前記透光部と非透光部を接着にて固定

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させたことを特徴とする請求項１乃至９記載の衛生装置。

【請求項１１】　フィルター内部側での発光部側と受光部側との間の光伝達を遮る遮光部を前記フィルターに設けたことを特徴とする請求項１乃至１０記載の衛生装置。

【請求項１２】　前記発光部と前記受光部を一体にしたセンサユニットを有することを特徴とする請求項１乃至１１記載の衛生装置。

【請求項１３】　前記フィルターと前記センサユニットを一体にしたことを特徴とする請求項１乃至１２記載の衛生装置。

【請求項１４】　前記フィルターに前記センサユニットを嵌合により一体にしたことを特徴とする請求項１乃至１３記載の衛生装置。

【請求項１５】　前記フィルターに前記センサユニットを係合により一体にしたことを特徴とする請求項１乃至１３記載の衛生装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、使用者の有無を検知する光センサを備えた衛生装置に関する。特に、局部衛生洗浄装置、自動便蓋・便座開閉装置、大便器自動洗浄装置など、便座使用者の有無を検知する着座検出手段や便器使用者の有無を検知する人体検出手段を有する衛生装置に好適である。また、自動水栓、小便器自動洗浄装置、自動手指乾燥・殺菌・消毒器等にも好適である。

【０００２】

【従来の技術】本発明に関係する従来の衛生装置の物体検出センサシステムの例として、衛生洗浄装置の着座センサで説明する。従来の衛生洗浄装置の着座センサを示す図２９において、フィルター４はケースカバー３に引っ掛かり部４Ａを引っかけて、ケースカバー３に固定されている。また、センサユニット１０は、発光部１１と受光部１２と仕切板１３が一体形成されている。ここで、フィルター４は、投光部４Ｅの厚みを均一にし、投射光２１がフィルター４により屈折しないように配慮して作られていた。また、同様に、フィルター４は、受光部４Ｆの厚みを均一にし、反射光２２がフィルター４により屈折しないように配慮して作られていた。したがって、センサユニット単体での検出距離とセンサユニットの前方へフィルターを取付けた衛生洗浄装置の状態での検出距離は、ほぼ同等となっていた。

【０００３】

【発明が解決しようとする課題】しかしながら、実際の商品開発においては、種々の市場ニーズに対する商品の品揃えに効率的に対応するために、例えば一つの基本仕様を基にして客先に応じた種々のバリエーションを持った類似商品群を開発していくことが多い。したがって、衛生洗浄装置の着座センサや人体検知センサと呼ばれる

物体検出センサシステムにおいても、客先の要求仕様や設置条件によって、その対応として種々のバリエーションのシステムを開発することが要求されている。そのため従来の物体検出センサシステムでは、例えば、従来の衛生洗浄装置の着座センサや人体検知センサの検出距離を長くしたり、短くしたりする場合は、図３０に示すようにセンサユニット１０における受光レンズ２３の位置を変更する等の手段が取られることが一般的であった。また、場合によっては、発光レンズの寸法や、反射光を検知する受光部や、受光部の受けた光の受光スポット位置により対象物の検出の有無を判断する判断回路等の変更が必要となり、多大なコストが発生し、且つ、製作に時間を要していた。また、センサユニットの検出距離違いのバリエーションが増えることにより、製造時の組み立てコストや管理コストが高くなっていた。本発明は、上記課題を解決するためになされたもので、本発明の目的は、センサユニットの前方光路上に備えているフィルターのみ交換すれば、それ以外のセンサユニットや判断回路の仕様を変更すること無く、例えば、衛生洗浄装置の着座センサや人体検知センサといった、装置に搭載された物体検出センサシステムとしての検出性能を変えることができる衛生装置を提供することにある。

【０００４】

【課題を解決するための手段及び作用・効果】上記課題を解決するために、請求項１の衛生装置では、物体検知用の検知用光を被検出物体に向けて投射光として発する発光素子を有する発光部と、前記投射光が物体に反射して返ってくる反射光を受けその受光スポット位置に応じた電気的出力を行なう受光素子を有する受光部と、前記受光部からの出力情報により対象物の有無を判断する判断回路と、前記発光部および／または前記受光部の光束上に設けられたフィルターとを、備えた物体検出センサシステムを有する衛生装置において、前記フィルターの前記投射光または反射光が透過する透光部を形成する一対の表裏２面を、面軸を前記表裏各々の面を透過する光束の中心を通りかつその面に鉛直な直線とした時に、その面軸が他方に対して傾けられているように構成されていることを特徴とする。この発明によれば、衛生装置の物体検出センサシステムにおいて、物体検出センサシステムの発光部から投射した光が非検知物体に当たって反射されて受光部に戻ってくる間で、フィルターを透過するときに光の進路(光路)が曲がる「プリズム効果」が起こり、透過光の光路の軸の方向が変わることになる。これにより、投射光と反射光の光路の交差する点、すなわち、物体検出センサシステムとしての検出ポイントが移動する。よって、フィルターの表裏２面の面軸を適当な組み合わせに変更することによってそれ以外のセンサユニットや判断回路の仕様を変更すること無く、装置に搭載された物体検出センサシステムとしての検出性能を３次元的に任意に変えることができる。

【０００５】上記課題を解決するために、請求項２の衛生装置では、前記フィルターの表裏２面の前記面軸をともに含む平面が、発光素子の光路の軸と受光素子の光路の軸とを含む平面に対して、平行であることを特徴とする。この発明によれば、衛生装置の物体検出センサシステムにおいて、物体検出センサシステムの発光部から投射した光が非検知物体に当たって反射されて受光部に戻ってくる間で、フィルターを透過するときに光の進路(光路)が曲がる「プリズム効果」が起こり、透過光の光路の軸の方向が変わることになる。これにより、投射光と反射光の光路の交差する点、すなわち、物体検出センサシステムとしての検出ポイントが移動する。よって、フィルターの表裏２面の面軸を適当な組み合わせに変更することによってそれ以外のセンサユニットや判断回路の仕様を変更すること無く、装置に搭載された物体検出センサシステムとしての検出性能を２次元的に任意に変えることができる。これにより、検出有りと判断する受光スポット位置へ結像する反射光が戻る検出対象物距離が変わり、センサの検出距離を長くしたり、短くしたりすることができるようになる。

【０００６】上記課題を解決するために、請求項３の衛生装置では、前記フィルターの表裏２面の前記面軸をともに含む平面が、発光素子の光路の軸と受光素子の光路の軸とを含む平面に対して、傾けられていることを特徴とする。この発明によれば、衛生装置の物体検出センサシステムにおいて、物体検出センサシステムの発光部から投射した光が非検知物体に当たって反射されて受光部に戻ってくる間で、フィルターを透過するときに光の進路(光路)が曲がる「プリズム効果」が起こり、透過光の光路の軸の方向が変わることになる。これにより、投射光と反射光の光路の交差する点、すなわち、物体検出センサシステムとしての検出ポイントが移動する。よって、フィルターの表裏２面の面軸を適当な組み合わせに変更することによってそれ以外のセンサユニットや判断回路の仕様を変更すること無く、装置に搭載された物体検出センサシステムとしての検出性能を任意に変えることができる。

【０００７】上記課題を解決するために、請求項４の衛生装置では、前記発光部と、前記受光部と、前記フィルターの前記投射光または前記反射光に対応する前記透光部の形状を複数有した前記フィルターとの光学的な相対位置関係を変更して前記投射光と前記反射光の各々の光路の軸が交差する点である監視ポイントを変化させる監視ポイント変更手段を有することを特徴とする。この発明によれば、衛生装置の設置状態に合わせて最適な監視ポイントをその現場で選択できたり、工場での組み立て時に出荷先の仕様に合わせた監視ポイントにあらかじめ設定して出荷できる。またフィルターと発光部と受光部と判断回路を含む構成が同じで、その他の部分が異なるような商品の品揃えを行なう場合も、光学的な相対位置

関係を選択することによって簡単かつ安価なコストとで対応できる。

【０００８】上記課題を解決するために、請求項５の衛生装置では、前記監視ポイント変更手段が、前記発光部または／および前記受光部を移動させるものであることを特徴とする。この発明によれば、発光部または／および受光部各々に対応するフィルターの位置に発光部または／および受光部を移動させるだけで種々の監視ポイントに合った衛生装置を得る事が出来る。

【０００９】上記課題を解決するために、請求項６の衛生装置では、前記監視ポイント変更手段が、前記フィルターを移動させて前記透光部の形状を選択するものであることを特徴とする。この発明によれば、投射光、反射光各々の光路を簡単な構造で変えることができるため、発光部と受光部と判断回路はそのままで監視ポイントを大きく変えることが可能となる。したがって、例えば、衛生洗浄装置に適用する場合、使用者の着座と離座といった監視ポイントの異なる検出モードにもフィルターを電磁ｿﾚﾉｲﾄﾞ等のアクチュエータをつかって移動させる事によって簡単に対応可能である。

【００１０】上記課題を解決するために、請求項７の衛生装置では、前記発光部と、前記受光部と、前記フィルターの前記投射光または前記反射光に対応する前記透光部の形状を遠点検知における透過部形状と近点検知における透過部形状を各々変化させたことを特徴とする。この発明によれば、遠点検知における透過部形状と近点検知における透過部形状を各々変化させることができるため、遠点検知性能及び近点検知性能を客先の要求仕様や設置条件にあったものを提案することが可能となる。

【００１１】上記した各発明において、フィルターを光が透過する部分と光が透過しない部分とに分け、前記光が透過する部分は透過材料で形成し、前記光が透過しない部分は不透過材料で形成してもよい。また、フィルターの光が透過する部分と光が透過しない部分を２色成形、または、２重成形、または、インサート成形にてフィルターを一体成形してもよい。さらに、フィルターの光が透過する部分と光が透過しない部分を接着にて固定してもよい。さらに、フィルターに、フィルター内部での発光部側と受光部側との間の光伝達を遮る遮光部を設けてもよい。

【００１２】

【発明の実施の形態】本発明の実施の形態を、局部衛生洗浄装置の着座センサにより説明する。図１は、本発明の衛生装置の実施例である衛生洗浄装置を洋風便器に装着した外観図である。図２は、着座センサをケースプレートに取り付けた状態図である。

【００１３】図３（Ａ）は、本発明の第１実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。図３（Ｂ）は、本発明の第２実施例であるフィルター、着座センサ、及び、センサ取付台の

状態を示す断面図である。図４（Ａ）は、本発明の第３実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。図４（Ｂ）は、本発明の第４実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。図５（Ａ）は、本発明の第５実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。図５（Ｂ）は、本発明の第６実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。図６は、着座センサの投射光、及び、反射光の幾何学的関係を示す図である。図７は、投光部、及び、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。図８は、図７における、反射光が受光部を通過する幾何学的関係を示す拡大図である。図９は、投光部、及び、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。図１０は、図９における、検出距離変動量の幾何学的関係を示す拡大図である。

【００１４】図１１は、本発明の第１実施例である投光部を受光側に向けて厚くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。図１２は、図１１における、反射光が受光部を通過する幾何学的関係を示す拡大図である。図１３は、本発明の第１実施例である投光部を受光側に向けて厚くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【００１５】図１４は、本発明の第２実施例である投光部を受光側に向けて薄くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。図１５は、図１４における、反射光が受光部を通過する幾何学的関係を示す拡大図である。図１６は、本発明の第２実施例である投光部を受光側に向けて薄くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【００１６】図１７は、本発明の第３実施例である受光部を投光側に向けて薄くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。図１８は、図１７における、反射光が投光部を通過する幾何学的関係を示す拡大図である。図１９は、　本発明の第３実施例である受光部を投光側に向けて薄くなるように片面をβ°傾け、且つ、投

光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【００１７】図２０は、本発明の第４実施例である受光部を投光側に向けて厚くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。図２１は、図２０における、反射光が投光部を通過する幾何学的関係を示す拡大図である。図２２は、本発明の第４実施例である受光部を投光側に向けて厚くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【００１８】図２３は、本発明の第５実施例であるフィルターとセンサ取付台を一体的に形成した場合を示す図である。

【００１９】図２４は、本発明の第６実施例である投光部および受光部に各々面の傾きが異なるフィルターを複数配設した場合を示す図である。

【００２０】図２５は、本発明の第７実施例であるフィルターを移動させて前記透光部の形状を選択した場合の検出距離変動量の幾何学的関係を示す図である。

【００２１】図２６は、本発明の第８実施例である投光部および受光部の厚みを変化させ監視ポイントを仰角方向に変化させた場合を示す図である。図２７は、遠点検知性能と近点検知性能における幾何学的関係を示す図である。

【００２２】図２８は、本発明の第９実施例であるフィルターを移動させて前記透光部の形状を選択した場合の検出距離変動量の幾何学的関係を示す図である。

【００２３】図２９は、従来のフィルター、及び、着座センサの状態を示す断面図である。図３０は、従来の投光部、及び、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【００２４】以下、本発明の第１の実施例を図１、２、３（Ａ）、６～１３を参照しながら説明する。図１、２に示すように、１は衛生洗浄装置本体である。ケースプレート２の上に、ケースカバー３が取り付けられ、ケースプレート２とケースカバー３の中にセンサ本体が配設され、着座センサ１０のフィルター４がケースカバー３に取り付けられている。

【００２５】図３（Ａ）に示すように、フィルター４は、発光部側４Ｅと受光部側４Ｆの間を縁切りする遮光部材５を有していて、ケースカバー３に引っ掛かり部４Ａを引っかけて、ケースカバー３に固定されている。着座センサ１０は、発光部１１と受光部１２が一体形成され、センサ取付台６に挿入された状態で引っかかり部６Ａに係合し、センサ取付台６はケースカバー３の中でセンサ取付台固定具（ビス）８でケースプレートのボス９に取り付けられている。センサ取付台６は発光部１１側に筒状遮光部７があり、筒状遮光部７と遮光部材５はオーバーラップしている。

【００２６】そこで、センサ前方に備えているフィルターの投光部の厚みを変化させることにより、着座センサや人体検知センサの検出性能が変わる原理を説明する。図６に示すように、着座センサ１０の受光レンズ２３から受光部１２間距離をY1、着座センサ１０の前面２４から受光レンズ２３間距離をY2、着座センサ１０の前面２４から検出対象物４０間距離をＬ0とする。また、発光部１１の中心から受光素子の検出ポイント位置１５間距離をX1とする。その場合、発光部１１からの投射光２１が投光レンズ２０により細く絞られ検出対象物４０へ照射される。その投射光２１は検出対象物４０の表面で拡散反射し、反射角θ0の反射光２２が受光レンズ２３により受光部の検出ポイント位置１５上に結像される。その受光角θ0は①式で求められる。

θ0＝Atan(X1/(L0+Y1+Y2))・・・・・・（１）

【００２７】次に、図７、８に示すように、投光部４Ｅの厚みが均一で、且つ、受光部４Ｆの厚みが均一なフィルター４を着座センサ１０に平行に前方へ備えた場合について説明する。着座センサ１０の前面からフィルター前面間距離をY3とする。その場合、発光部１１からの投射光２１は、フィルター４の投光部４Ｅへ基準面Ａ（５０）の法線５１に対して投射角０°、屈折角０°で進入し、投光部４Ｅから外へ基準面Ａ（５０）の法線５１に対して投射角０°、屈折角０°で通過する。その投射光２１は、検出対象物４０へ照射され、検出対象物４０の表面で拡散反射する。その拡散反射した反射角θ0の反射光２２Ａは、フィルター４の受光部４Ｆへ基準面Ａ（５０）の法線５１に対して投射角θ0°、屈折角θ1°で進入し（反射光２２Ｂ）、受光部４Ｆから外へ基準面Ａ（５０）の法線５１に対して投射角θ1°、屈折角θ0°で通過する（反射光２２）。ここで、空気の屈折率をN、フィルターの屈折率をN'とするとその屈折角θ1は②式で求められる。屈折の第二法則により、N'/N＝sinθ0/sinθ1　となるため、

θ1＝Asin(N/N'＊sinθ0)・・・・・・（２）

したがって、フィルターの影響による検出距離変動量△L1は(３)式で求められる。ここで、図９、１０に示すように、a＝t0＊tanθ0、b＝t0＊tanθ1、c＝a－ｂであるため、

△L1＝c/tanθ0

△L1＝t0＊(tanθ0－tanθ1)/tanθ0・・・・・（３）

【００２８】次に、図１１、１２に示すように、フィルター４の投光部のみ受光側に向けて厚くなるように片面をβ°傾ける。そのβ°傾けた面を基準面Ｂ（５２）とする。その場合、発光部１１からの投射光２１は、フィルター４の投光部４Ｅへ基準面Ａ（５０）の法線５１に

対して投射角０°、屈折角０°で進入し、投光部４Ｅから外へ基準面Ｂ（５２）の法線５３に対して投射角β°、屈折角θ4°で通過する。その投射光２１Ａは、検出対象物４０へ照射され、検出対象物４０の表面で拡散反射する。その反射光２２Ａは、フィルター４の受光部４Ｆへ基準面Ａ（５０）の法線５１に対して投射角θ０°、屈折角θ1°で進入し、受光部４Ｆから外へ基準面Ａ（５０）の法線５１に対して投射角θ1°、屈折角θ０°で通過する（反射光２２）。

【００２９】その屈折角θ4は(７)式で求められる。屈折の第二法則により、 N'/N= sinθ4/sin β となる＊ため、

θ4= Asin(N'/N＊sin β)・・・・・(７)

したがって、屈折角θ4と、投光部の傾斜角βと、投光部の厚みが均一なフィルターを備えた場合の屈折角０°との関係は、 β－θ4＜０° となるため、着座センサ１０の前面から検出対象物４０間距離は、投光部の厚みが均一で、且つ、受光部の厚みが均一なフィルターを備えた場合と比較して短くなることになる。その距離△L4は(１３)式で求められる。ここで、図１３に示すように、k=(L0+△L1－Y3－△L4)＊tan(θ4－β) であるため、

△L4= k/tanθ０

L4= (L0+△L1－Y3)＊tan(θ4－β)/(tanθ０+ tan(θ4－β))・・・・・(１３)

【００３０】この発明によれば、フィルター４の投光部４Ｅを受光側に向けて厚くなるように片面をβ°傾けることにより、投射光２１がフィルター４の投光部４Ｅを透過するときに「プリズム効果」が起こり、投射光２１の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、投光部の厚みが均一で、且つ、受光部の厚みが均一なフィルターを備えた場合と比較して短くなることになる。よって、センサユニットの前方に備えているフィルターのみ交換すれば、センサユニットの検出性能を変更すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能を短く変えることができる。

【００３１】次に、本発明の第２の実施例を図３（Ｂ）、１４、１５、１６参照しながら説明する。図３（Ｂ）、１４、１５に示すように、フィルター４の投光部のみ受光側に向けて薄くなるように片面をβ°傾ける。そのβ°傾けた面を基準面Ｃ（５４）とする。その場合、発光部１１からの投射光２１は、フィルター４の投光部４Ｅへ基準面Ａ（５０）の法線５１に対して投射角０°、屈折角０°で進入し、投光部４Ｅから外へ基準＊面Ｃ（５４）の法線５５に対して投射角β°、屈折角θ5°で通過する。その投射光２１Ｂは、検出対象物４０へ照射され、検出対象物４０の表面で拡散反射する。その反射光２２Ａは、フィルター４の受光部４Ｆへ基準面Ａ（５０）の法線５１に対して投射角θ0°、屈折角θ1°で進入し、受光部４Ｆから外へ基準面Ａ（５０）の法線５１に対して投射角θ1°、屈折角θ0°で通過する（反射光２２）。

【００３２】その屈折角θ5は(８)式で求められる。屈折の第二法則により、 N'/N= sinθ5/sin β となるため、

θ5= Asin(N'/N＊sin β°)(８)

したがって、屈折角θ5と、投光部の傾斜角βと、投光部の厚みが均一なフィルターを備えた場合の屈折角０°との関係は、 θ5－β＞０° となるため、着座センサ１０の前面から検出対象物４０間距離は、投光部の厚みが均一なフィルターを備えた場合と比較して長くなることになる。その距離△L5は(１４)式で求められる。ここで、図１６に示すように、m=(L0+△L1－Y3+△L5)＊tan(θ5－β) であるため、

△L5= m/tanθ０

L5= (L0+△L1－Y3)＊tan(θ5－β)/(tanθ０－tan(θ5－β))・・・・・(１４)

【００３３】この発明によれば、フィルター４の投光部４Ｅを受光側に向けて薄くなるように片面をβ°傾けることにより、投射光２１がフィルター４の投光部４Ｅを透過するときに「プリズム効果」が起こり、投射光２１の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、投光部の厚みが均一なフィルターを備えた場合と比較して長くなることになる。よって、センサユニットの前方に備えているフィルターのみ交換すれば、センサユニットの検出性能を変更すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能を長く変えることができる。

【００３４】次に、本発明の第３の実施例を図４（Ａ）、１７、１８、１９を参照しながら説明する。図４（Ａ）、１７、１８に示すように、フィルター４の受光部のみ投光側に向けて薄くなるように片面をβ°傾ける。そのβ°傾けた面を基準面Ｄ（５６）とする。その場合、発光部１１からの投射光２１は、フィルター４の投光部４Ｅへ基準面Ａ（５０）の法線５１に対して投射角０°、屈折角０°で進入し、投光部４Ｅから外へ基準面Ａ（５０）の法線５１に対して投射角0°、屈折角0°で通過する。その投射光２１は、検出対象物４０へ照射され、検出対象物４０の表面で拡散反射する。その反射光２２Ｃは、フィルター４の受光部４Ｆへ基準面Ｄ（５６）の法線５７に対して投射角θ7°、屈折角θ6°で進入し（反射光２２Ｄ）、受光部４Ｆから外へ基準面Ａ（５０）の法線５１に対して投射角θ1°、屈折角θ0°

で通過する（反射光２２）。

【００３５】その屈折角θ6は(９)式で求められる。

$\theta 6 = \theta 1 - \beta$ ・・・・・(９)

また、投射角θ7は(１０)式で求められる。屈折の第二法則により、　$N'/N = \sin\theta 7/\sin\theta 6$　となるため、

$\theta 7 = \mathrm{Asin}(N'/N * \sin\theta 6)$

ここで、(９)を代入すると

$\theta 7 = \mathrm{Asin}(N'/N * \sin(\theta 1 - \beta))$ ・・・・・(１０)

したがって、投射角θ7と、受光部の傾斜角βと、受光部の厚みが均一なフィルターを備えた場合の投射角θ０＊

$L6 = (L0 + \triangle L1 - Y3) * (\tan\theta 0 - \tan(\theta 7 + \beta)) / \tan(\theta 7 + \beta)$ ・・・(１５)

【００３６】その距離△L6は(１５)式で求められる。ここで、図に示すように、

$X3 = (L0 + \triangle L1 - Y3) * \tan\theta 0$

$X3 = (L0 + \triangle L1 - Y3 + \triangle L6) * \tan\theta 8$　であるため、

$\triangle L6 = (L0 + \triangle L1 - Y3) * (\tan\theta 0 - \tan\theta 8) / \tan\theta 8$

ここで、$\theta 8 = \theta 7 + \beta$　であるため

【００３７】この発明によれば、フィルター４の受光部４Ｆを投光側に向けて薄くなるように片面をβ°傾けることにより、反射光２２Ｃがフィルター４の受光部４Ｆを透過するときに「プリズム効果」が起こり、反射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、受光部の厚みが均一なフィルターを備えた場合と比較して長くなることになる。よって、センサユニットの前方に備えているフィルターのみ交換すれば、センサユニットの検出性能を変更すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能を長く変えることができる。

【００３８】次に、本発明の第４の実施例を図４（Ｂ）、２０、２１、２２を参照しながら説明する。図４（Ｂ）、２０、２１に示すように、フィルター４の受光部のみ投光側に向けて厚くなるように片面をβ°傾ける。そのβ°傾けた面を基準面Ｅ（５８）とする。その場合、発光部１１からの投射光２１は、フィルター４の投光部４Ｅへ基準面Ａ（５０）の法線５１に対して投射角０°、屈折角０°で進入し、投光部４Ｅから外へ基準面Ａ（５０）の法線５１に対して投射角0°、屈折角0°で通過する。その投射光２１は、検出対象物４０へ照射され、検出対象物４０の表面で拡散反射する。その反射光２２Ｅは、フィルター４の受光部４Ｆへ基準面Ｅ（５＊

$L7 = (L0 + \triangle L1 - Y3) * (\tan(\theta 10 - \beta) - \tan\theta 0) / \tan(\theta 10 - \beta)$ ・・・・(１６)

【００４１】この発明によれば、フィルター４の受光部４Ｆを投光側に向けて厚くなるように片面をβ°傾けることにより、反射光２２Ｃがフィルター４の受光部４Ｆを透過するときに「プリズム効果」が起こり、反射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、受光部の厚みが均一なフィルターを備えた場合と比較して短くなることになる。よって、センサユニットの前方に備えているフィルターのみ交換すれば、センサユニットの検出性能を変更すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能を短く変えることができる。

【００４２】次に、本発明の第５の実施例を図５（Ａ）を参照しながら説明する。図５（Ａ）に示すように、フィルター４の投光部４Ｅを受光側に向けて薄くなるよう＊の関係は、　$\theta 7 + \beta < \theta 0$　となるため、着座センサ１０の前面から検出対象物４０間距離は、受光部の厚みが均一なフィルターを備えた場合と比較して長くなることになる。

【００３９】その屈折角θ9は(１１)式で求められる。

$\theta 9 = \theta 1 + \beta$ ・・・・(１１)

また、投射角θ10は(１２)式で求められる。屈折の第二法則により、　$N'/N = \sin\theta 10/\sin\theta 9$　となるため、

$\theta 10 = \mathrm{Asin}(N'/N * \sin(\theta 1 + \beta))$ ・・・・(１２)

したがって、投射角θ10と、受光部の傾斜角βと、受光部の厚みが均一なフィルターを備えた場合の投射角θ０の関係は、　$\theta 10 - \beta > \theta 0$　となるため、着座センサ１０の前面から検出対象物４０間距離は、受光部の厚みが均一なフィルターを備えた場合と比較して短くなることになる。

【００４０】その距離△L7は(１６)式で求められる。ここで、図に示すように、

$X3 = (L0 + \triangle L1 - Y3) * \tan\theta 0$

$X3 = (L0 + \triangle L1 - Y3 - \triangle L7) * \tan\theta 11$　であるため、

$\triangle L7 = (L0 + \triangle L1 - Y3) * (\tan\theta 11 - \tan\theta 0) / \tan\theta 11$

ここで、$\theta 11 = \theta 10 - \beta$　であるため

に片面をβ°傾け、且つ、フィルター４の受光部４Ｆを投光側に向けて薄くなるように片面をβ°傾ける。　この発明によれば、フィルター４の投光部４Ｅを受光側に向けて薄くなるように片面をβ°傾けることにより、投射光がフィルター４の投光部４Ｅを透過するときに「プリズム効果」が起こり、投射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、投光部の厚みが均一なフィルターを備えた場合と比較して長くなることになる。

【００４３】また、フィルター４の受光部４Ｆを投光側に向けて薄くなるように片面をβ°傾けることにより、反射光がフィルター４の受光部４Ｆを透過するときに「プリズム効果」が起こり、反射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象

＊８）の法線５９に対して投射角θ10°、屈折角θ9°で進入し（反射光２２Ｆ）、受光部４Ｆから外へ基準面Ａ（５０）の法線５１に対して投射角θ1°、屈折角θ0°で通過する（反射光２２）。

物４０間距離は、受光部の厚みが均一なフィルターを備えた場合と比較して長くなることになる。よって、センサユニットの前方に備えているフィルターのみ交換すれば、センサユニットの検出性能を変更すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能をよりいっそう長く変えることができる。

【００４４】次に、本発明の第６の実施例を図５（Ｂ）を参照しながら説明する。図５（Ｂ）に示すように、フィルター４の投光部４Ｅを受光側に向けて厚くなるように片面をβ°傾け、且つ、フィルター４の受光部４Ｆをのみ投光側に向けて厚くなるように片面をβ°傾ける。

この発明によれば、フィルター４の投光部４Ｅを受光側に向けて厚くなるように片面をβ°傾けることにより、投射光がフィルター４の投光部４Ｅを透過するときに「プリズム効果」が起こり、投射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、投光部の厚みが均一なフィルターを備えた場合と比較して短くなることになる。

【００４５】また、フィルター４の受光部４Ｆを投光側に向けて厚くなるように片面をβ°傾けることにより、反射光２２Ｃがフィルター４の受光部４Ｆを透過するときに「プリズム効果」が起こり、反射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、受光部の厚みが均一なフィルターを備えた場合と比較して短くなることになる。よって、センサユニットの前方に備えているフィルターのみ交換すれば、センサユニットの検出性能を変更すること無く、衛生洗浄装置の着座センサや人体検知センサの検出性能をよりいっそう短く変えることができる。

【００４６】また、フィルターを光が透過する部分と光が透過しない部分とに分け、前記光が透過する部分は透過材料で形成し、前記光が透過しない部分は不透過材料で形成することにより、全て透過材料で形成する場合と比較して、安価に製作することができる。さらに、フィルターの光が透過する部分と光が透過しない部分を２色成形、または、２重成形、または、インサート成形にてフィルターを一体成形することにより、両者間にすき間がなくなり、汚れや埃等がつまらなくなる。また、同材質、同色にすることにより外観を良好にすることができる。さらには、密着性も良く、接合強度も格段に向上する。

【００４７】さらに、フィルター４に、フィルター内部での発光部１１側と受光部１２側との間の光伝達を遮る遮光部５を設けることにより、フィルター内面４Ｂに水滴が生じた時、発光部１１からの光が乱反射しても、筒状遮光部７と遮光部材５がオーバーラップしているため、フィルター４の内面４Ｂで乱反射した反射光は受光部１２に漏れて当たることはない。また、フィルター外面４Ｃに水滴、キズ、及び尿等の汚れが付いた時でも、発光部１１からの光がフィルター外面に乱反射してフィルター内部での反射光が発生するが、フィルター４の発光部１１側と受光部１２側の間を縁切りする遮光部材５により、その反射光はフィルター４の発光部１１側にとどまる。よって、フィルター内部での反射光が受光部１２に入らなくなり、フィルター自体の肉厚によりフィルター内を内部反射する光の影響を完全に無くすことができる。したがって、フィルタ内面の水滴、及び、フィルター外面の水滴、キズ、及び尿等の汚れによる誤検知が防止され、センサの信頼性が格段に向上する。

【００４８】さらに、図２３に示すように、フィルター４とセンサ取付台６を一体的に形成し、着座センサ１０をセンサ取付台６に固定しても良い。そうすることにより、フィルター４とセンサ取付台６の間の位置バラツキが無くなり、着座センサの感知領域のバラツキが小さくなり、センサの感知の精度が向上する。

【００４９】さらに、図２４に示すように、フィルター４は、上方に発光部側４Ｅと受光部側４Ｆを設け、下方に発光部側４Ｇと受光部側４Ｈを設ける。その間を縁切りする遮光部材５を有していて、ケースカバー３に固定されている。着座センサ１０は、フィルター４の上方と下方に可動できる。フィルター４の上方の発光部側４Ｅと受光部側４Ｆの厚み変化と、フィルター４の下方の発光部側４Ｇと受光部側４Ｈの厚み変化を異ならせることにより、上方と下方の「プリズム効果」が異なり、投射光、及び、反射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、上方と下方で異なることになる。

【００５０】よって、着座センサ１０をフィルター４の上方と下方に可動させることにより、異なる検出性能を得ることができ、例えば、便座上に座っている人の識別と便器の前に立っている人の識別が可能となる。したがって、従来は２つのセンサを使用していたが、この技術を利用すると１つのセンサで達成することができ、大幅なコストダウンとなる。

【００５１】さらに、図２５に示すように、フィルター４を移動させて受光部側４Ｆの厚みを変化させることにより、移動前と移動後の「プリズム効果」が異なり、反射光の角度が変わることになる。これにより、着座センサ１０の前面から検出対象物４０間距離は、移動前と移動後で異なることになる。

【００５２】よって、フィルター４の移動により、異なる検出性能を得ることができ、例えば、便座上に座っている人の識別と便器の前に立っている人の識別が可能となる。したがって、従来は２つのセンサを使用していたが、この技術を利用すると１つのセンサで達成することができ、大幅なコストダウンとなる。

【００５３】さらに、図２６に示すように、投光部４Ｅを仰角方向に厚みを変化させることにより、投射光２１が変化し、監視ポイントを仰角方向に変化させることになる。よって、センサレイアウトに関係なく監視ポイン

トを設定することができる。さらに、フィルター４の移動もしくはセンサ１０の移動により、異なる監視ポイントを得ることができ、例えば、常時フィルター４の移動もしくはセンサ１０の移動を行えば、便器の前に立っている３次元的に監視が可能となる。

【００５４】図２７に示すように、遠点検知時には、反射光２２はフィルター４の遠点受光部透過ポイント６２ａを通過する。また、近点検知時には、反射光２２ｑはフィルター４の近点受光部透過ポイント６２ｂを通過する。その場合、検出可能領域６０a及び検出不可能領域６１aは図２７に示すようなる。そこで、図２８に示すように、遠点検知時の遠点受光部透過ポイント６２ａと近点検知時の近点受光部透過ポイント６２ｂに対応する前記透光部の形状を各々変化させることにより、反射光２２ｃがフィルター４の遠点受光部透過ポイント６２ａを通過するように変化するため、検出対象物が４０ａから４０ｃに変化する。

【００５５】また、近点検知時においては、反射光２２ｈがフィルター４の近点受光部透過ポイント６２ｂを通過するように変化するため、検出対象物が４０ｂから４０ｄに変化する。よって、検出可能領域が６０aから６０ｂに変化し、検出不可能領域が６１aが６１ｂに変化する。したがって、この発明によれば、客先の要求仕様や設置条件にあったものを提案することが可能となる。

【００５６】以上本発明の実施例を詳述したが、これはあくまでも一例であり、本発明の要旨を変更しない限り、種々の変形が可能である。また、実施例として衛生洗浄装置を例にあげて説明したが、もちろん他の衛生装置にこの発明を適用することができ、自動で便蓋あるいは便座を開閉させる装置、自動で大便器洗浄をさせる装置、自動水栓、小便器自動洗浄、自動手指乾燥・殺菌・消毒器等に適用可能である。

【図面の簡単な説明】

【図１】本発明の衛生洗浄装置本体の斜視図を示す。

【図２】本発明のケースプレート、着座センサ、及び、センサ取付台の取付状態の図を示す。

【図３】（Ａ）　本発明の第１実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。

（Ｂ）　本発明の第２実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。

【図４】（Ａ）　本発明の第３実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。

（Ｂ）　本発明の第４実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。

【図５】（Ａ）　本発明の第５実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。

（Ｂ）　本発明の第５実施例であるフィルター、着座センサ、及び、センサ取付台の状態を示す断面図である。

【図６】着座センサの投射光、及び、反射光の幾何学的関係を示す図である。

【図７】投光部、及び、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【図８】図７における、反射光が受光部を通過する幾何学的関係を示す拡大図である。

【図９】投光部、及び、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【図１０】図９における、検出距離変動量の幾何学的関係を示す拡大図である。

【図１１】本発明の第１実施例である投光部を受光側に向けて厚くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【図１２】図１１における、反射光が受光部を通過する幾何学的関係を示す拡大図である。

【図１３】本発明の第１実施例である投光部を受光側に向けて厚くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【図１４】本発明の第２実施例である投光部を受光側に向けて薄くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【図１５】図１４における、反射光が受光部を通過する幾何学的関係を示す拡大図である。

【図１６】本発明の第２実施例である投光部を受光側に向けて薄くなるように片面をβ°傾け、且つ、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【図１７】本発明の第３実施例である受光部を投光側に向けて薄くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【図１８】図１７における、反射光が投光部を通過する幾何学的関係を示す拡大図である。

【図１９】本発明の第３実施例である受光部を投光側に向けて薄くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【図２０】本発明の第４実施例である受光部を投光側に向けて厚くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【図２１】図２０における、反射光が投光部を通過する幾何学的関係を示す拡大図である。

【図２２】本発明の第４実施例である受光部を投光側に向けて厚くなるように片面をβ°傾け、且つ、投光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、フィルターの影響による検出距離変動量の幾何学的関係を示す図である。

【図２３】本発明の第５実施例であるフィルターとセンサ取付台を一体的に形成した場合を示す図である。

【図２４】本発明の第６実施例である投光部および受光部に各々面の傾きが異なるフィルターを複数配設した場合を示す図である。

【図２５】本発明の第７実施例であるフィルターを移動させて前記透光部の形状を選択した場合の検出距離変動量の幾何学的関係を示す図である。

【図２６】本発明の第８実施例である投光部および受光部の厚みを変化させ監視ポイントを仰角方向に変化させた場合を示す図である。

【図２７】遠点検知性能と近点検知性能における幾何学的関係を示す図である。

【図２８】本発明の第９実施例であるフィルターを移動させて前記透光部の形状を選択した場合の検出距離変動量の幾何学的関係を示す図である。

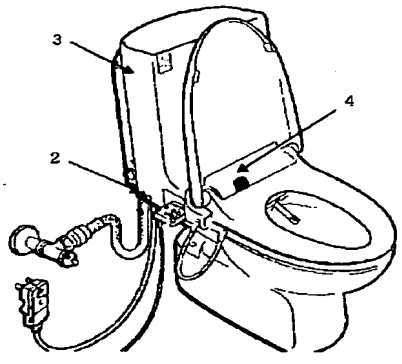
【図２９】従来のフィルター、及び、着座センサユニットの状態を示す断面図である。

【図３０】従来の投光部、及び、受光部の厚みが均一なフィルターを着座センサ前方に備えた状態における、投射光、及び、反射光の幾何学的関係を示す図である。

【符号の説明】

1　衛生洗浄装置本体
2　ケースプレート
＊3　ケースカバー
4　フィルター
4A　引っ掛かり部
4E　投光部側
4F　受光部側
5　遮光部材
6　センサ取付台
7　筒状遮光部
8　取付台固定具（ビス）
9　ボス
10　着座センサ
11　発光部
12　受光部
13　仕切板
14　弾性部材
15　検出ポイント位置
16　監視ポイント
20　発光レンズ
21　投射光
22　反射光
23　受光レンズ
24　前面（着座センサ）
40　検出対象物
50　基準面A
51　基準面Aに対する法線
52　基準面B
53　基準面Bに対する法線
54　基準面C
55　基準面Cに対する法線
56　基準面D
57　基準面Dに対する法線
58　基準面E
59　基準面Eに対する法線
60a、60b　検出可能領域
61a、61b　検出不可能領域

【図１】



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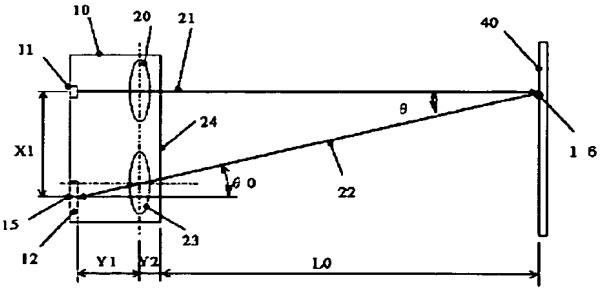

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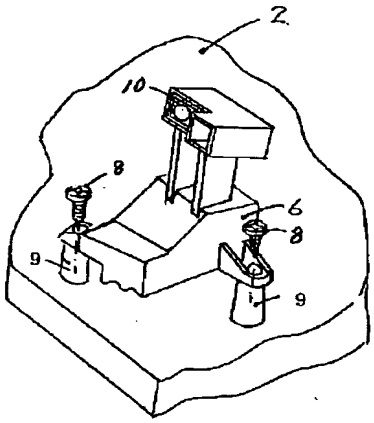

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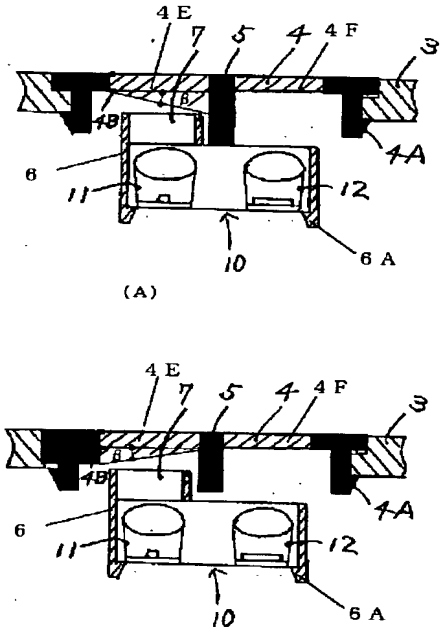

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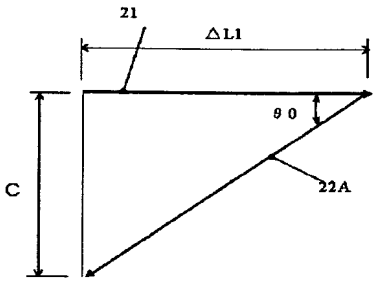

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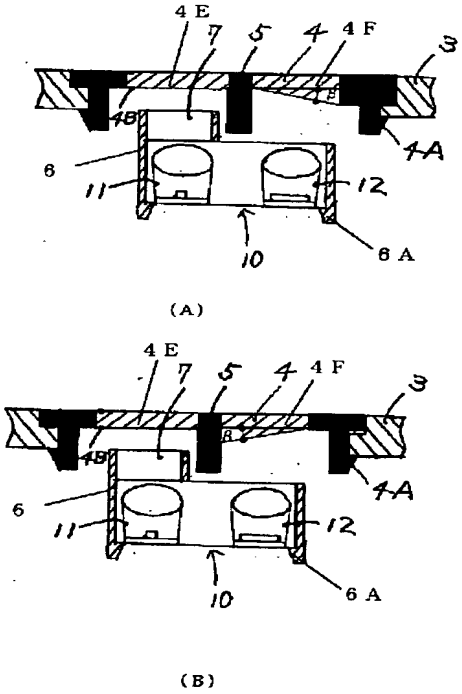

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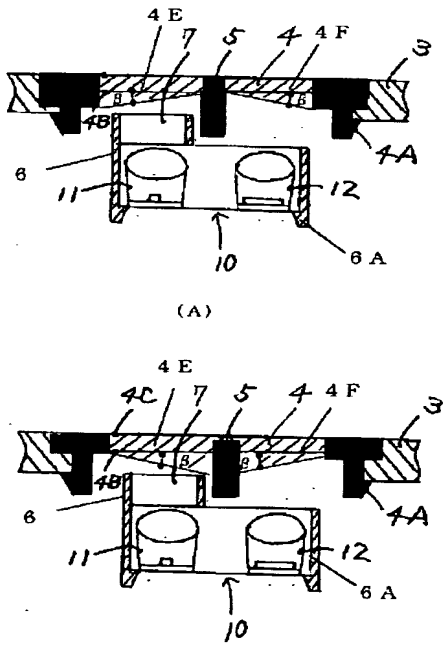

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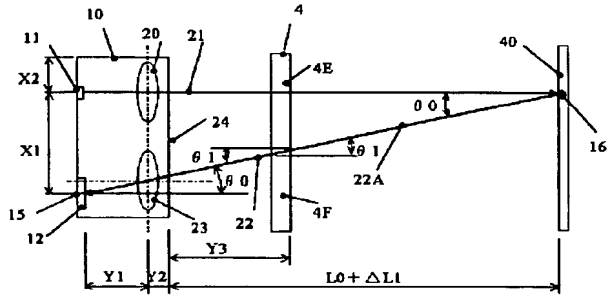

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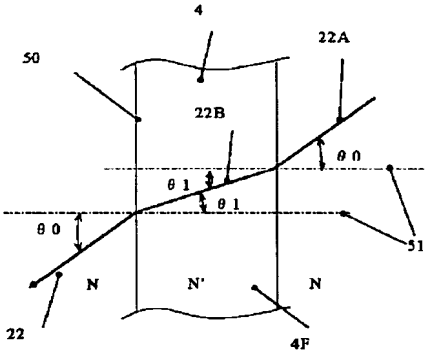

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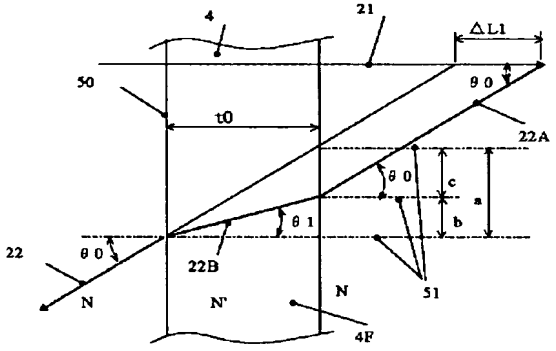

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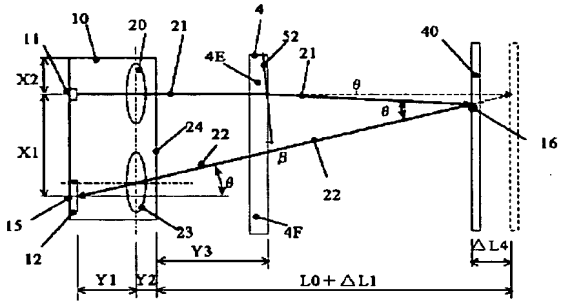

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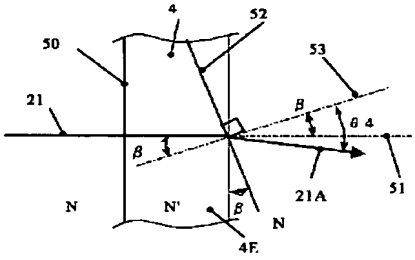

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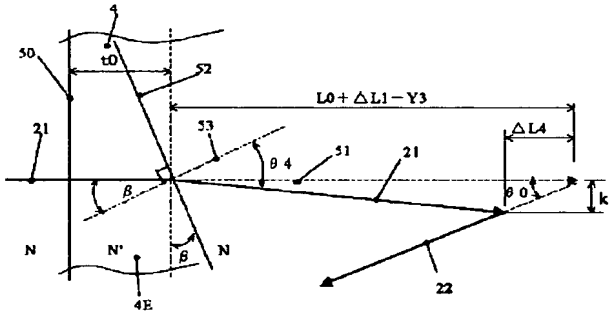

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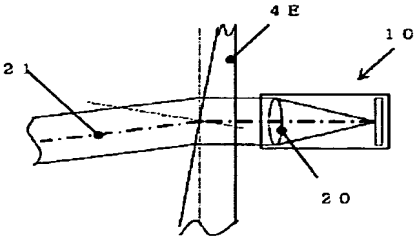

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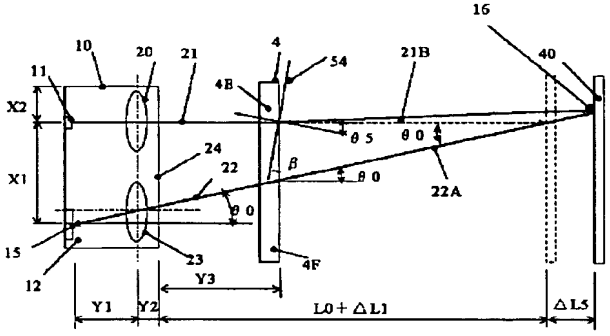

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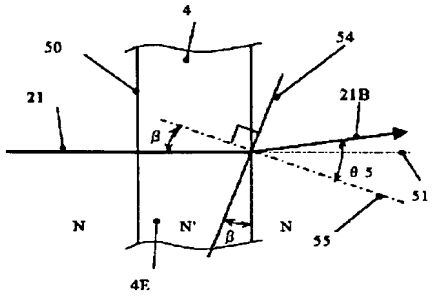

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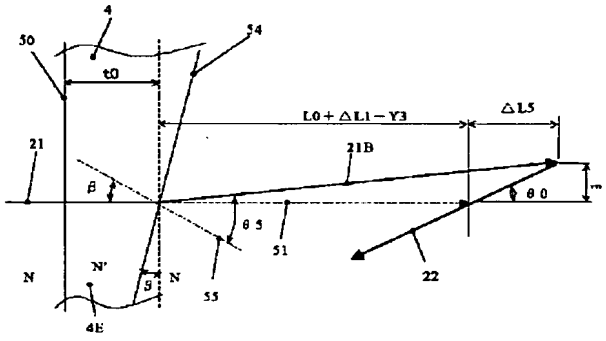

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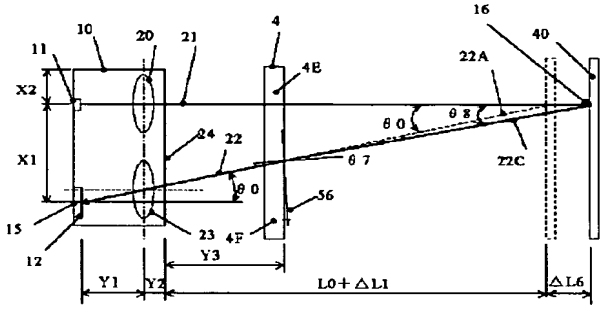

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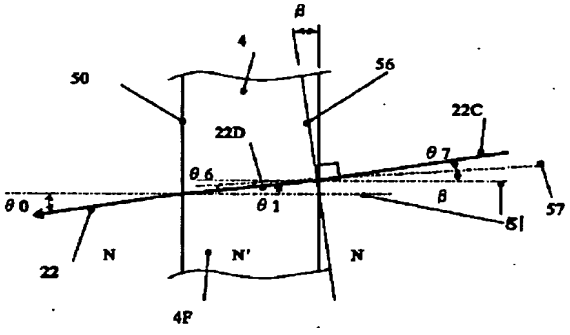

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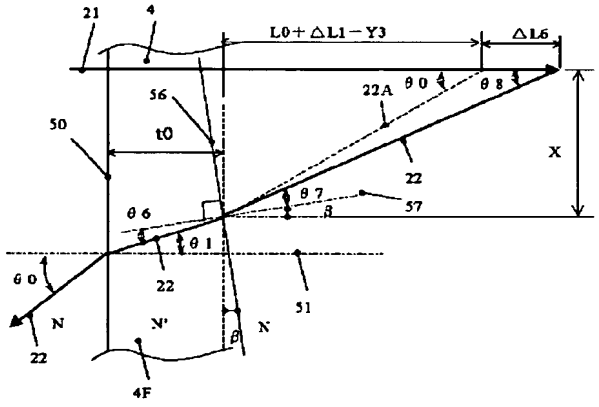

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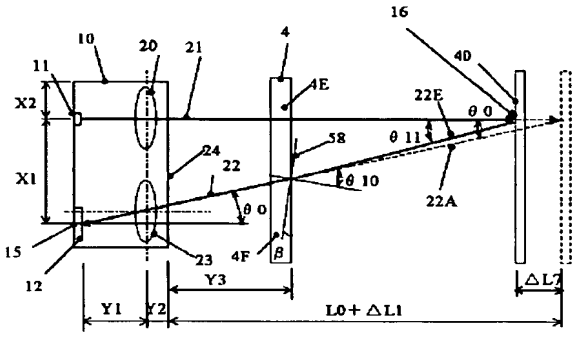

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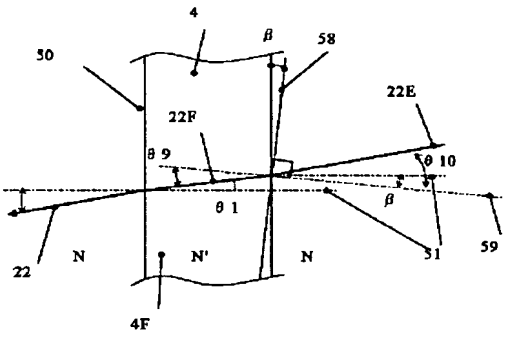

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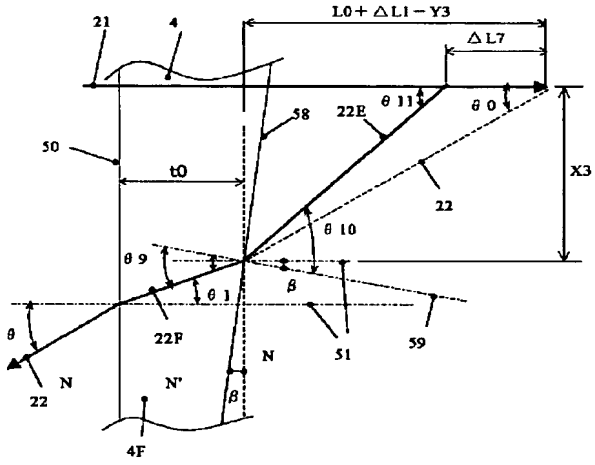

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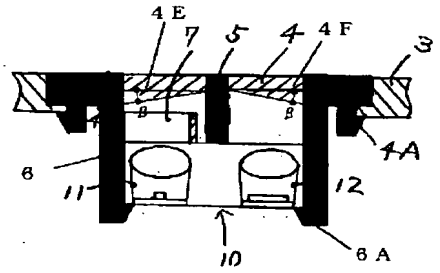

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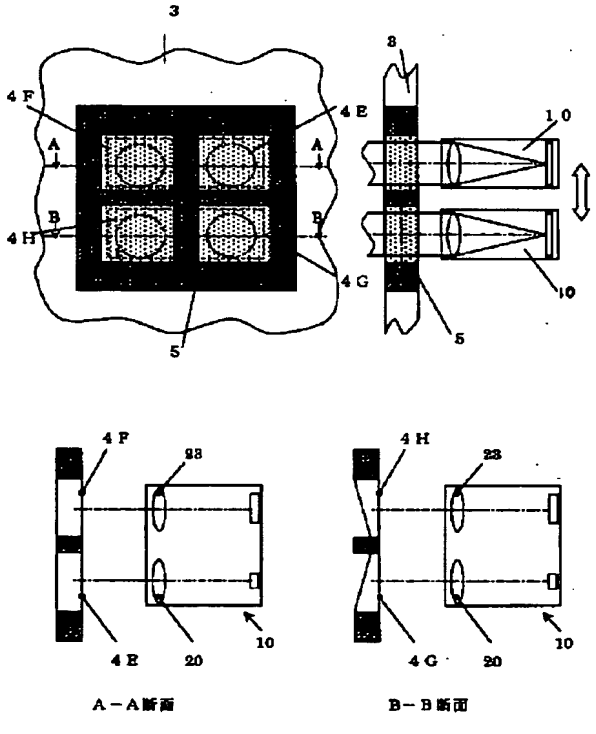

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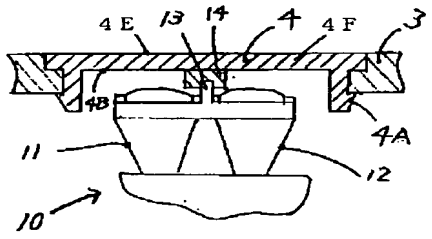

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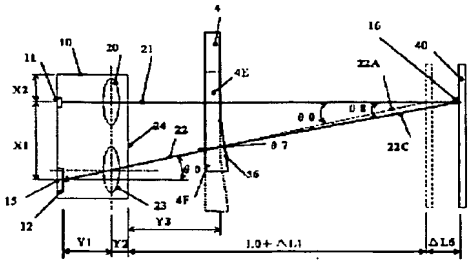

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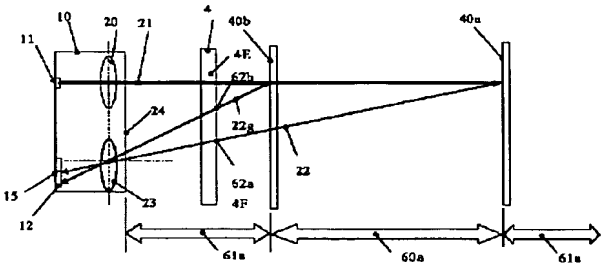

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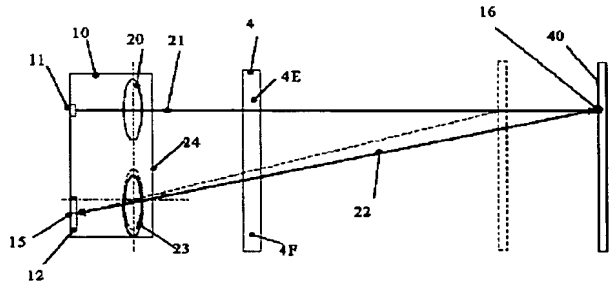

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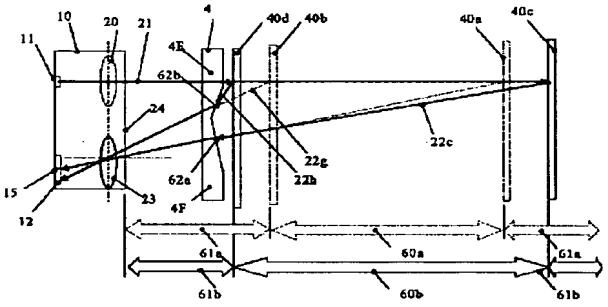

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